Wind Farm Development in Burgenland, Austria

Daniel Obeler

Submitted May 2015
In fulfillment of the requirements of the Master of Urban Planning Capstone Project and
Network for European United States Regional and Urban Studies (NEURUS) Program

Home University: University of Illinois at Urbana-Champaign
Host University: Wirtschaftsuniversität Wien (Vienna University of Economics and Business)

Recognition

Thank you to the following individuals for their assistance and support during this project:

- Professor Brian Deal of the University of Illinois at Urbana-Champaign
- Professor Andrew Greenlee of the University of Illinois at Urbana-Champaign
- Professor Gunther Maier of the Vienna University of Economics and Business
- The 2014-2015 NEURUS cohort

Table of Contents

Abstract

The following capstone report is the result of independent research through the Department of Urban and Regional Planning at the University of Illinois at Urbana-Champaign, the Vienna University of Economics and Business, and the Network for European and U.S. Regional and Urban Studies. Through qualitative and quantitative research, this report identifies the policies, decision making processes, and siting considerations for wind farm development in the Federal State of Burgenland, in southeast Austria. Guided by the sustainability frameworks of the WWF Austria and a triple bottom line paradigm, the research was accomplished through a study of renewable energy and electrical grid policy; thirteen semi-structured stakeholder interviews and thematic analysis of the interview data; and a GIS spatial analysis of the land use considerations encountered by local wind farm developer. In addition to its naturally advantageous location, Burgenland is successful in wind energy because of extensive stakeholder engagement and acceptance, stringent environmental sustainability measures, effective spatial planning methods, and a high level of political commitment. Burgenland offers an important case study for wind farm development because of these best practices utilized in balancing sustainability objectives.

Introduction

Global Climate Change

Since 2013, CO_2 levels have surpassed 400 parts per million (ppm) multiple times, compared to pre-industrial CO_2 concentration levels of approximately 280 ppm. The increase of CO_2 concentration levels in the atmosphere has raised Earth's average temperature by 1.6°F since the beginning of the 20th century.[1] In essence, the carrying capacity of Earth and of humanity is at risk. In order for harmful greenhouse gases (GHG) and consequences to be kept under control while also meeting the electricity and security needs of a growing global society, a complete paradigm shift is necessary for how society generates, transmits, and consumes energy. Countries must move rapidly to become fully dependent on low carbon-emitting sources of energy.

A Renewable Energy Future

To reduce the human impact on climate change and lower the amount of carbon dioxide equivalents (CO_2E) in the atmosphere, there must be significant strides made towards transitioning to a future where electricity is completely generated by renewable energy sources. GHG emitting fossil fuels and coal must be completely phased out because their production, use, and disposal methods have significant health and environmental impacts, including air and water pollution and land degradation. Despite their impact on climate change, fossil fuels and coal currently represent the majority of electricity generation across the world because of their low cost and abundant supply. These traditional sources of dirty energy generation are deeply entrenched in international economic systems and challenge the required low-carbon energy future.

To meet the base and peak loads of energy demand, future energy generation will require a broad mix of clean energy resources and sustainable practices. Renewable energy offers a lower risk and plentiful source of electricity but must to be planned and managed accordingly. As technologies advance and costs lower, these technologies will have shorter payback periods as well as lower operation and maintenance costs. Ultimately, transitioning to a fully renewable energy and decarbonized economy will save money on a net basis. Gradually, renewable energy sources will achieve grid parity. The levelized cost of electricity (LCOE) for renewable energy will be at or below the traditional electricity price offered by the electric grid.[2] A mix of clean energy resources, especially solar photovoltaic (PV) and offshore and onshore wind energy, are needed. Renewable energy can gain an even greater share of global energy generation when combined with advanced energy battery storage that absorbs and dispatches, energy efficiency measures within the built environment, and a mass incorporation of sustainable practices in all sectors (i.e. cradle-to-cradle). To ensure renewable energy functionality, the electrical transmission and distribution system is evolving.

Emerging Changes to Electrical Grid Infrastructure and Utilities

In the past, a central electricity grid controlled the supply and demand capacities for energy customers. Today and in the future, the electrical grid will look and act slightly different.

Distributed generation and micro-grid systems allow electricity to be produced and shared in smaller quantities but near the point of use, rather than in large amounts in only a few places. Advanced battery storage supports clean energy and efficiency advancements by storing electricity when it is not needed and discharging it when it is. Advances in Big Data and the Internet of Things enable users and energy utilities to effectively monitor and adjust their energy generation and usage. Net metering programs are being adopted to accurately measure customer demand and generation capacities, crediting owners for the excess electricity they generated and incorporate back to the grid. Demand response programs are being implemented to the support the electricity grid in balancing supply and demand. In exchange for time-based rates or other financial incentives, electricity customers reduce or shift their usage during peak periods.

Utility-backed regional and national electricity grids are still in place but will have their loads significantly changed. Transmission lines need to be upgraded and reconfigured in order to increase capacity and allow electrical power to flow in two directions. In order to effectively make the transition to 100% renewable energy, the interconnection, transmission, and distribution of electricity from diverse points of renewable energy generation needs to be resolved. The technological advances in sustainable energy and design that lead to greater customer control mean that the traditional electric utility model has to fundamentally change.

The utility's role is no longer only about delivering electricity; rather, it must maximize the value of renewable energy by taking into account the resources and potential brought by technological and customer-oriented innovations. The "utility death spiral" is well-documented, a result of demonstrably more efficient and cheaper ways of generating, using, and distributing clean electricity.[3] Greater market penetration of renewable energy resources and efficiency products, backed by varying legal mandates, will continue to drive down the costs of traditional fossil fuels. More energy customers will be motivated to leave the grid as the cost of renewable energy decreases, the cost of fossil fuels increases, and grid maintenance and operations costs increase. In turn, electrical grid costs grow even higher for the remaining customers, who now have an even greater incentive to pursue energy self-sufficiency. Balancing the renewable energy grid will require further investment in battery storage and the interconnection of multiple grids from multiple renewable energy sources. Globally, electric utilities must work to resolve these inherent and forthcoming issues while also managing expected levels of electricity reliability, resiliency, and affordability.

Research Question

Reconfiguring the global energy system is both urgent and complex. Transitioning from fossil fuels to renewable energy and from an inefficient electrical grid system to a modernized smart electricity network necessitates further study on multiple scales. This report entails a case study exploration of the policies, decision making processes, and siting considerations involved in the development of wind farms in Burgenland, Austria. The following question was explored:

What are the policies, decision making processes, and siting considerations involved in the development of wind farms and related electrical grid infrastructure in Burgenland, Austria?

Contextual understanding of the issue is first sought, followed by the literature review. After

identification of the research's methodology and sustainability frameworks, the study utilizes multi-level policy analysis, thematic analysis of stakeholder interview data, and Geographic Information Systems (GIS) to assess the key land use considerations in wind farm development by the company Energie Burgenland. The discussion then reviews key points of the qualitative and quantitative research using a SWOT analysis. The report concludes with recommendations and broader considerations for future wind farm growth.

This report is carried out in accordance with the Master of Urban Planning Capstone objectives set forth by the Department of Urban and Regional Planning at the University of Illinois at Urbana-Champaign (UIUC). Additionally, this report is supported by the Network for European and U.S. Regional and Urban Studies (NEURUS) Exchange Fellows program. As part of the 2014 – 2015 NEURUS program, the host institution Wirtschaftsuniversität Wien (Vienna University of Economics and Business) supported this report in research design and advising. In addition to this report, deliverables include an informative research poster and presentation at UIUC, and presentation at the NEURUS Spring Continental Seminar.

Background

Burgenland, Austria

Burgenland is one of Austria's nine Federal States (Länder), as seen in Figures 1 and 2. It is the least populous state with 287,416 persons, as of January 2014, and the third smallest in area (3,961.80 km^2).[4] See Appendix A for state administrative structure and population. Burgenland is the most eastern state in Austria, sharing the country's border with Hungary as well as small parts of Slovakia and Slovenia. To the west, Burgenland borders the states Styria and Lower Austria. Burgenland has nine administrative districts, consisting of two statutory cities (Eisenstadt, Rust) and seven rural districts (Neusiedl am See, Eisenstadt-Umgebung, Mattersburg, Oberpullendorf, Oberwart, Güssing, Jennersdorf).[5] See Appendix B for the population of Burgenland's administrative districts. Eisenstadt, located in the north, is the capitol of Burgenland and the largest municipality with a population of 13,485 persons.[6] There are 171 municipalities in Burgenland, but only fifteen, including Eisenstadt, have a population over 3,000 persons.[6]

Figure 1[7]

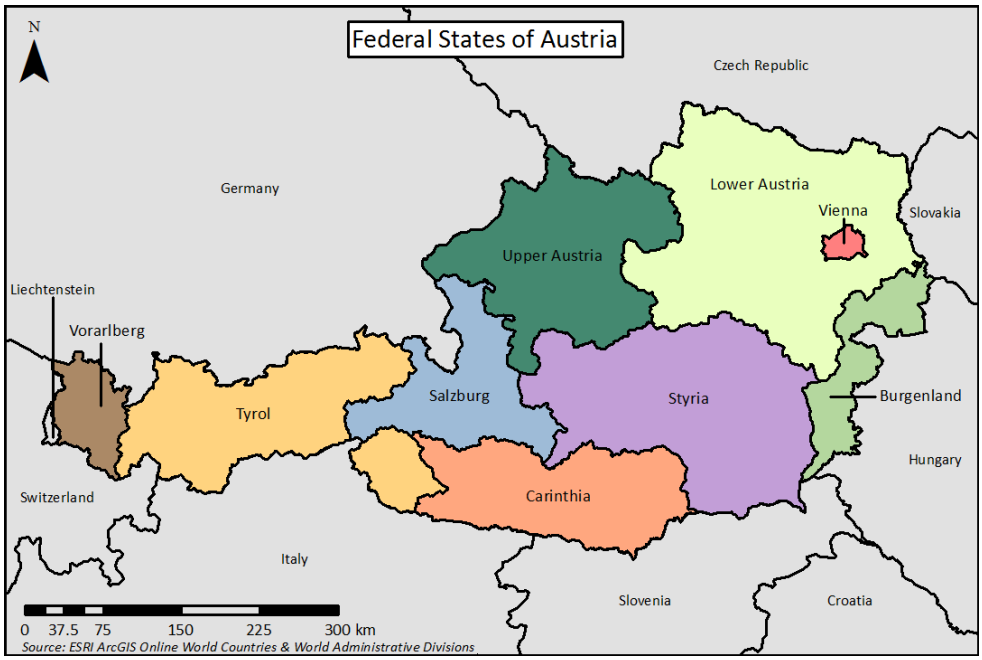
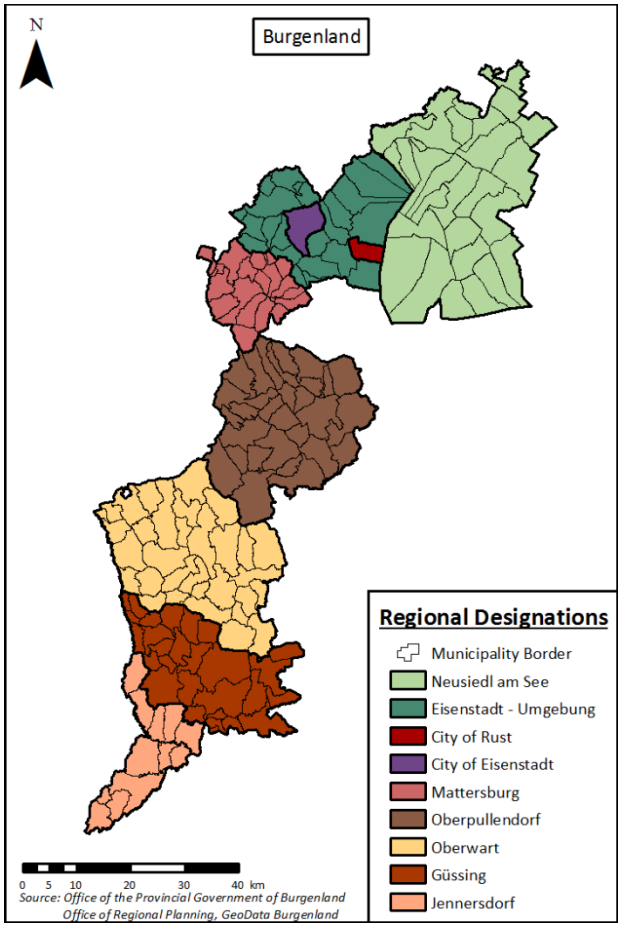


Figure 2[8]



Burgenland's local economy is predominantly agriculture based, including fruits, root vegetables, vine crops, grain such as corn, some tobacco and hemp, experimental rice, and livestock farming.[9] Small industries include limestone and basalt quarrying, China clay production, sugar refining, food processing, wine making, textile manufacturing, lumbering, sawmilling, and furniture making.[9] Across the state, farmland, open space, and low-forest cover dominate the landscape. Nearly three-fifths of Burgenland is arable and about one-third is forested.[10] The area's geography and topography is the primary reason for heavy natural resources development as well as tourism.

Northern Burgenland is characterized by its large open plains (Parndorfer Platte), the low-lying Pannonian Basin, parts of the lowland Leitha Mountains, low hills, and major wetlands (Lake Neusiedl, saline lakes, marshes, and lowland rivers). Such geography and land use patterns has meant that large natural and cultivated areas provide habitat for many of the steppe species, such as the imperial eagle, the great bustard, the saker falcon, the red-footed falcon and the European ground squirrel. The Rosalien Mountain Range between northern and middle Burgenland is the most mountainous part of the state, connecting to the Central Alps, Landsee Mountains, Bernsteiner Mountains, and Günser Mountains. Southern Burgenland primarily consists of low hills.

Until 1918, Burgenland was a part of the Hungarian side of the Austro-Hungarian Empire. In 1921, Burgenland became a part of the Republic of Austria. Since the second half of the 19th century, Burgenland had been economically weak due to nationalist, political, and geographical allegiances.[10,11] Following World War II, Burgenland regained its status as a Federal State and became a part of the Soviet occupation zone until 1955. The regional economy recovered slowly, as Burgenland received only 0.33% of Austrian recovery funds under the United States' Marshall Plan.[12]

As a result of Austria joining the EU in 1995, Burgenland obtained Objective 1 status and financial assistance through the EU Structural Fund. From 1994 to 1999 and from 2000 to 2006, designation of Objective 1 supported peripheral, low population density regions that are economically disadvantaged, with a per capita gross domestic product (GDP) lower than 75 % of the EU Community average. Following submission of a regional economic development plan (including description of the region's economic and social situation, description of the strategy for achieving development objectives, proposed use, and an indicative financing plan), Burgenland received €261 million in financial support between 1994 and 1999.[13] Burgenland strategically used that funding to develop their ecotourism sector, technical education, and renewable energy generation.

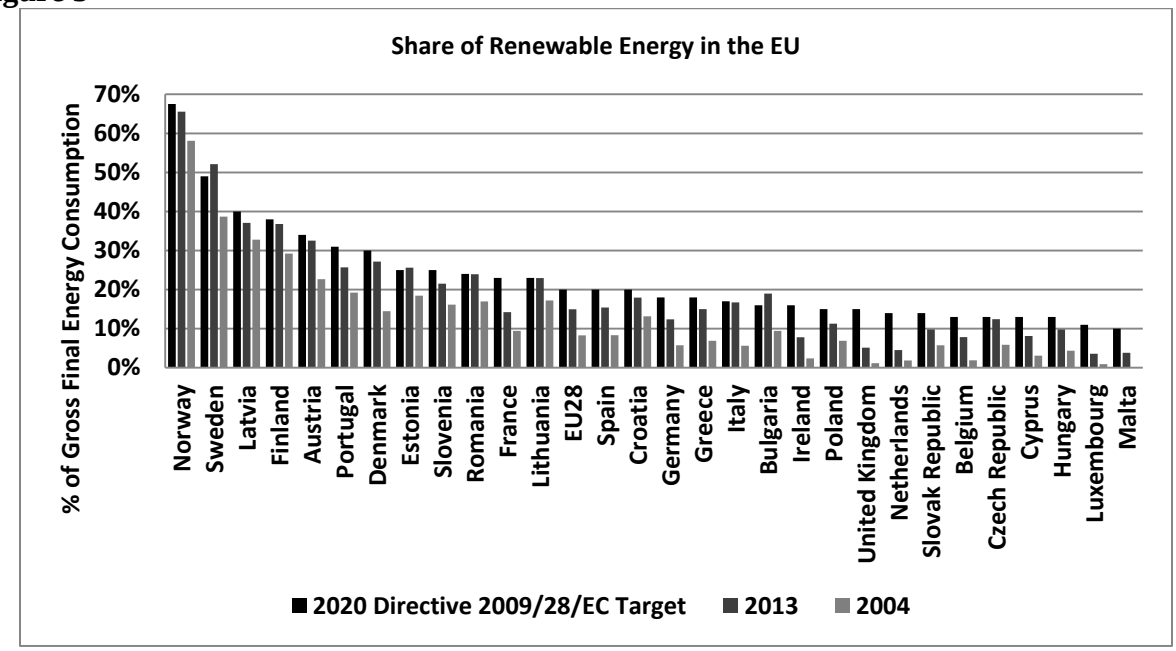
Since 2003, Burgenland is a member of the Central European Region (CENTROPE), comprised of eight federal provinces across four countries (Austria, Slovakia, Slovenia, and Czech Republic). The multilateral initiative supports internal and cross-border work, including new opportunities for economic development, an expanded labor market, promotion of science and research, improvement of transportation and infrastructure, support of culture and nature, and politics and administration.[14] Objective 1 designation and cross-border work through initiatives such as CENTROPE demonstrate the way in which Burgenland has changed economically. Today, Burgenland is best understood through the increasing amount of wind power. For

context, Austria's increased renewable energy generation is first identified.

Increasing Levels of Renewable Energy Generation in Austria

Austria has made significant progress in transitioning to renewable energy sources under the mandates set forth by the EU in Directive 2009/28/EC, which is addressed in further detail in a later section. In 2013, Austria ranked fourth out of the twenty-eight Member States with a 32.55% share of renewable sources in the gross final consumption of energy (including transportation, electricity, and heating and cooling).[15,16] In base year 2004, Austria's share was 22.66%. Figure 3 demonstrates Austria's achievements in energy compared to EU Member States since 2004.

Figure 3[16]



As identified in Figures 4 and 5, the share of electricity generated by renewable energy sources in Austria from 2004 to 2013 has increased. In 2004, the amount of electricity generated by renewable energy sources in Austria was 40,256 GWh, a share of 61.91%. In 2013, 48,889 GWh of electricity from renewable energy sources was generated in Austria, a share of 68.08%. Per Figure 5, the EU-28 average is much lower than Austria but is growing. In 2013, the EU-28 average share of electricity generated by renewable energy sources was 25.37%.

Figure 4[16]

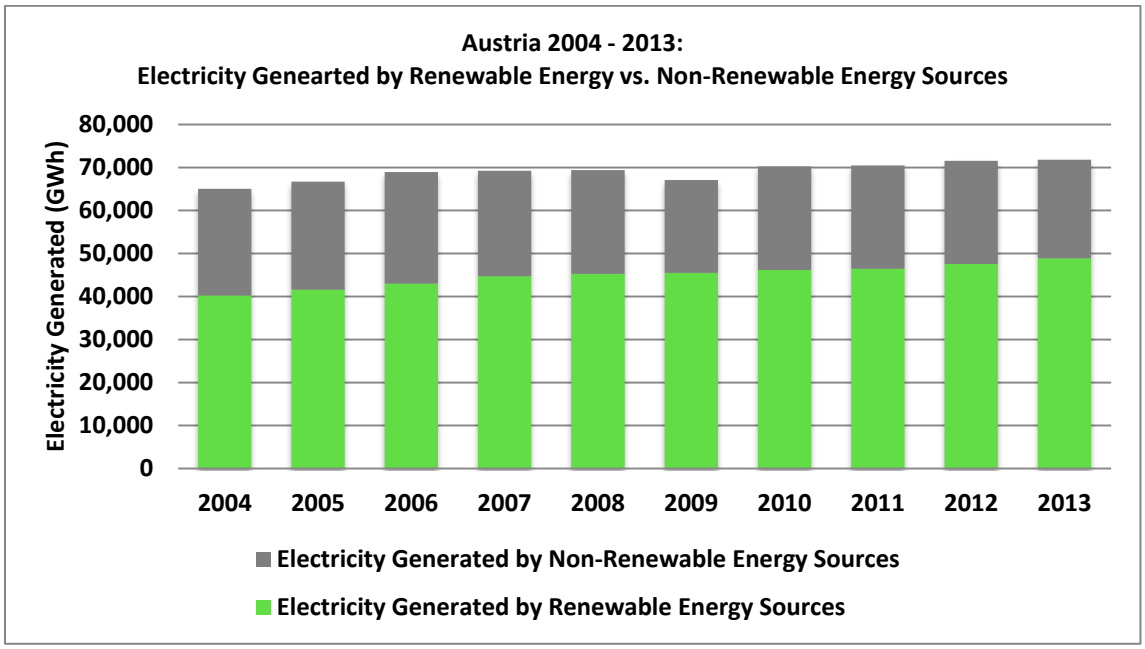
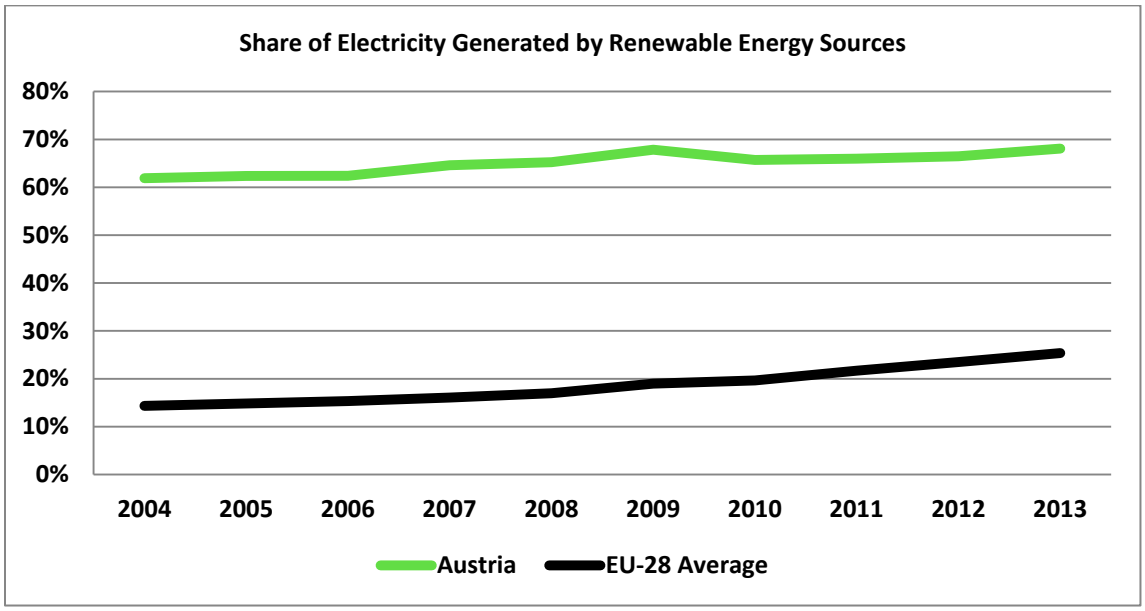


Figure 5[16]

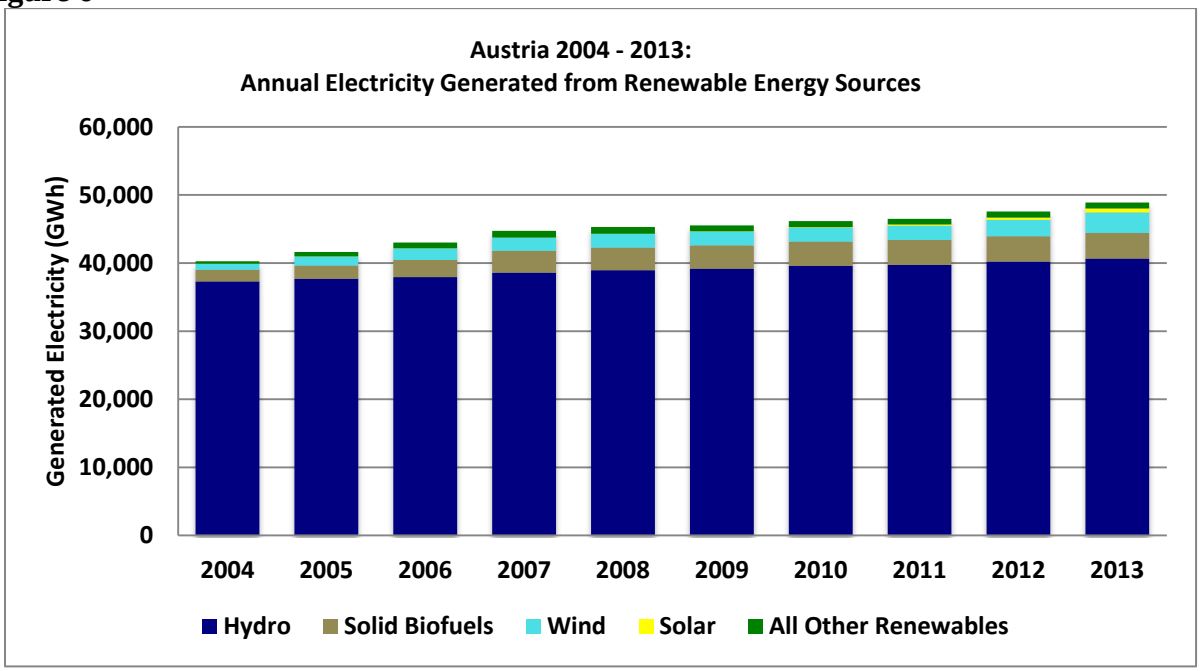


Austria's significant amount of renewable energy sources for electricity generation is largely due to its hydropower industry. Favorable geography and climatic conditions have made hydropower an easy choice for steady power generation and storage options. The country's mountains, rivers, and lakes contribute to Austria's extraordinary capacity for hydropower. As previously mentioned, hydropower can be a questionable source of clean, sustainable power. However, Austria and the EU consider hydropower to be a renewable source of energy and have established stringent regulations to maintain high environmental quality.

Since 1978, electricity generation in Austria has occurred without any nuclear power. The Zwentendorf nuclear power plant in Lower Austria, the country's only constructed nuclear facility, was never put into operation due to a public referendum prohibiting fission reactors for electrical power generation. 50.5% of voters decided against the €509 million nuclear power plant, stopping use of the facility by 30,000 votes and leading to adoption of the Nuclear Non-Proliferation Act.[17] Today, the plant serves as a training facility for safe nuclear operation and has some solar generation capacity.[18] Without nuclear power for electricity generation, there has been a long-standing and increased utilization of hydropower and other renewable energy sources.

Figure 6 highlights Austria's 2004 – 2013 mix of electricity generation by renewable energy sources. Hydropower provides the Austria's primary capacity for base and peak power loads. In 2013, hydropower generated 40,661.48 GWh, solid biofuels generated 3,759.41 GWh, wind generated 3,010.98 GWh, solar (PV and thermal generation) generated 582.16 GWh, and other sources (gaseous and liquid biofuels, renewable municipal waste, geothermal, tide, wave, and ocean) generated 875.46 GWh. Since 2004, all renewable energy sources have increased their total output of electricity but have grown at vastly different rates.

Figure 6[16]



For 2004 – 2013, the annual percentage growth rate for renewable energy sources of electricity is identified in Table 1. Although hydropower has been in steady operation for decades, its development has stagnated. This is primarily due to the limited availability of space for large-scale development, reoccurring environmental considerations and stakeholder pressures, and cost-competitive growth from other renewable energy sources. In 2014, 20,000 people signed a petition against expansion of the Kaunertal hydropower plant but the Tyrolean hydropower generation and distribution company TIWAG.[19] Despite its dominance in total electricity output, hydropower had the smallest growth rate of 0.90%. Far and away, solar had the highest annual

percentage growth rate with 305.91%. However, solar remains small in total electricity output. Wind had the second-highest annual percentage growth rate with 24.56%. Solid biofuels and other alternative sources both had a strong growth rate. To understand Austria's growth in electricity generation by renewable energy sources, it is important to look at the annual percentage growth rate as well as the total amount of new electricity generation.

Table 1[16]

Renewable Energy Source	2004 - 2013 Annual Percentage Growth Rate
Hydropower	0.90%
Solid Biofuels	12.12%
Wind	24.56%
Solar	305.91%
All Other Renewables	14.31%
Total	2.14%

Table 2[16]

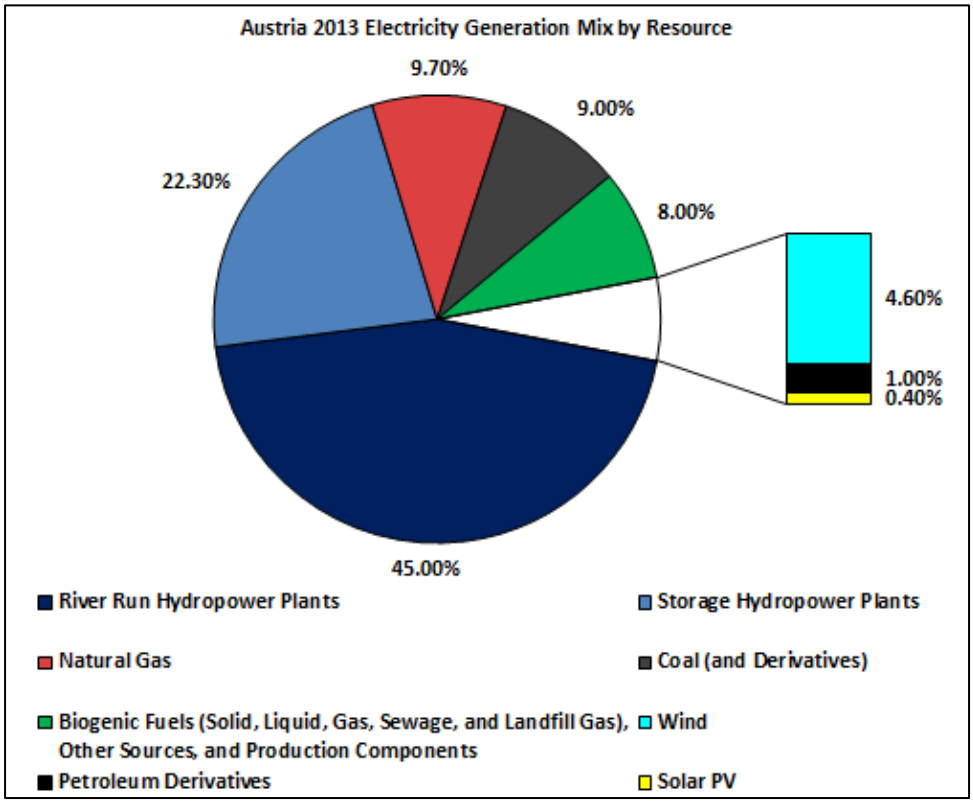
Renewable Energy Source	2004 - 2013 New Electricity Generated (GWh)
Hydro	3,354.81
Wind	2,139.75
Solid Biofuels	2,059.77
Solar	563.73
All Other Renewables	515.40
Total	8,633.46

Table 2 provides insight on new electricity generation from renewable energy sources. Although hydropower had the lowest annual percentage growth rate, it held the highest amount of new electricity generated. Although challenges in growth are present, as previously mentioned, hydropower is still able to maintain its lead in electricity generation. Solar, by far, had the highest annual percentage growth rate but it new electricity grew by a comparatively small amount. Solar has a high ceiling for contributing to electricity generation and the overall renewable transition, despite not primarily serving as a utility-scale source. In Austria as in most places, solar electricity is mainly achieved through individual rooftop installation. Large-scale solar operations exist but are few and have relatively small electricity output compared to other large-scale renewable energy systems.[20] Wind and solid biofuels have strong numbers in annual percentage growth rate as well as new electricity generated. Emerging wind and solid biofuel sources of electricity in Austria are achieving gains in electricity at an impactful and sustained level.

Using data from E-Control, the Austrian government regulator for electricity and natural gas markets, Figure 7 represents Austria's 2013 electricity generation and resource mix. As previously identified, hydropower, through river run facilities and storage, provides the bulk of electricity generation. Other renewables, especially biogenic fuels and wind, contribute as well. Fossil fuels including natural gas, coal, and petroleum round out the energy mix, reinforcing the possibility for renewable energy to achieve a greater share. Compared to data by Eurostat in

which the share of electricity generated by renewable energy was 68.08%, E-Control identifies the renewable energy share as 80.30% based on generation by hydropower, biofuels, wind, and solar.[21] In either case, the market penetration of renewables is on the rise.

Figure 7[21]



The growth of Austrian renewable energy for electricity generation has been demonstrated. Further observation and contextualization of wind power growth at the national and state level in Burgenland is necessary to conclude the background component of this research. The increasing amount of wind power in Burgenland establishes justification for a qualitative and quantitative research approach to understanding where and why wind farm development has been successful.

Record-breaking Wind Power Development in Austria and Burgenland

The Austrian Wind Energy Association (IG Windkraft) reports that wind power in Austria now has the annual potential to produce 6.5% of Austria's electricity consumption.[22] Through 2014, approximately 1,000 wind turbines with a total power capacity of approximately 2,000 MW have been installed in Austria, equivalent to providing electricity for more than 1.2 million households (1/3 of all Austrian households). By doubling current wind power production, wind power may generate 24% of Austria's electricity consumption by 2030. As will be detailed later, Austrian feed-in tariffs are fixed for 2014 and 2015, contributing to the long-term investment and development stability. Austria's exponential growth in wind power is displayed in Figure 8, although figures slightly differ with those previously identified in Figure 6, Table 1, and Table 2. Figure 9 illustrates how 2013 wind energy development is spread across the Federal States. Burgenland and Lower Austria clearly have the highest level of development. Of the total wind

power capacity installed in Austria in 2013, 52% was erected in Burgenland.[23] Similar achievements have been reported for 2014.

Figure 8[24]

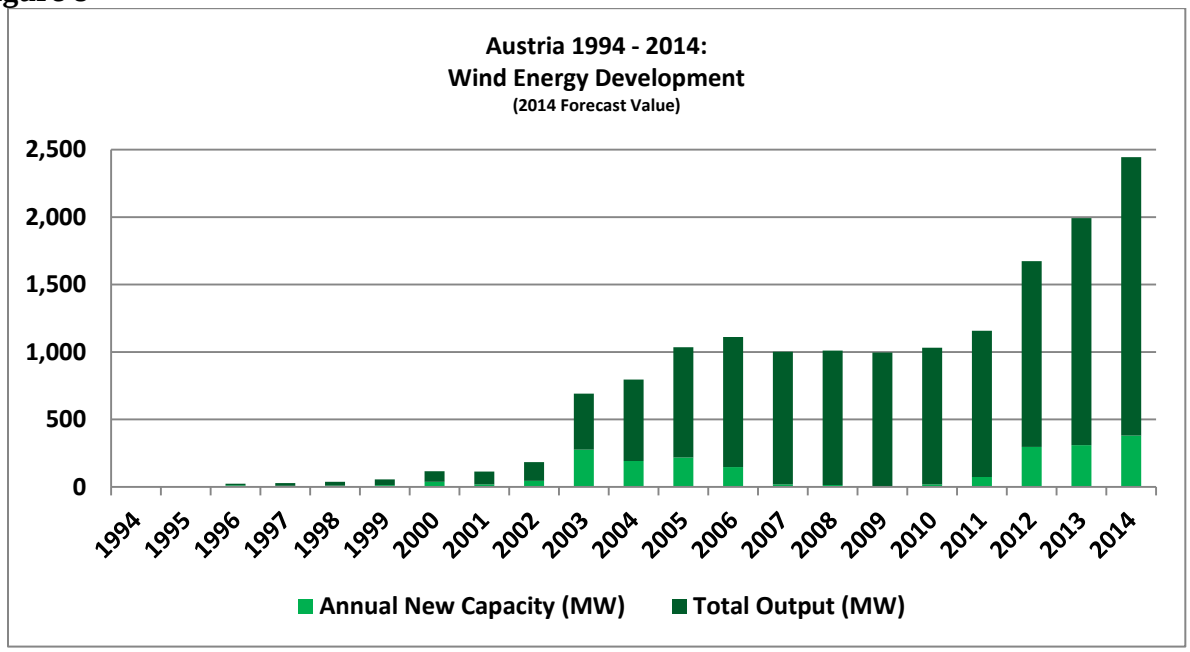
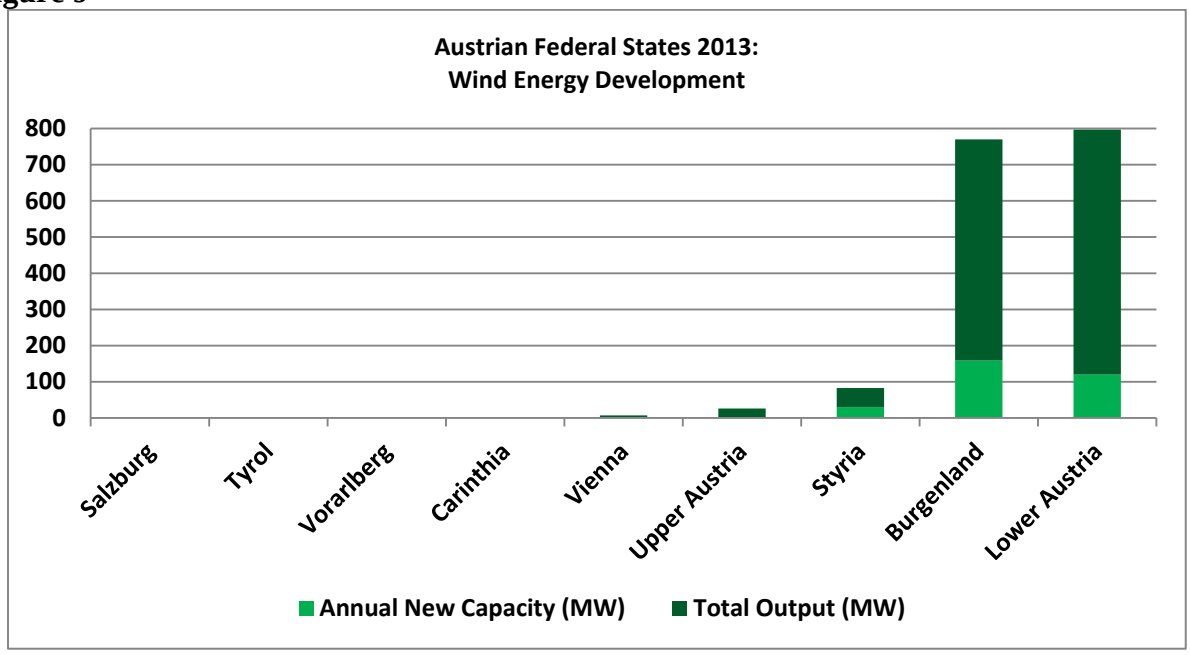


Figure 9[24]

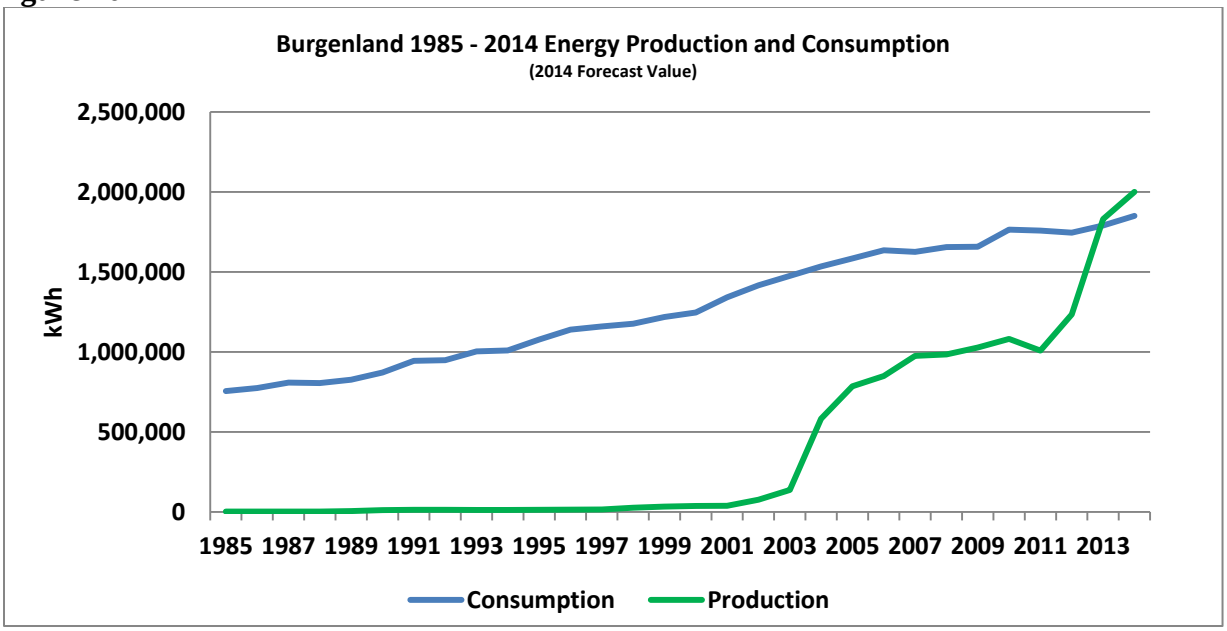


Wind farm development in Burgenland began in 1997 with a pilot-project of 6 wind turbines constructed in the community of Zurndorf. In 2001, the project expanded to 13 turbines. The first signficiant phase of wind farm expansion occured in 2003, largely due to introduction of the Federal Act on Supporting Electricity Produced from Renewable Energy Sources, also known as

the Green Electricity Act. This national feed-in tariff program for renewable energy sources is explored in further detail in the report. From 2003 – 2006, approximately 200 wind turbines with a nominal power of 370 MW were comissioned and constructed in Burgenland. A development lull ocurred from 2006 – 2011 due to the ending of the initial phase of the Green Electricity Act. Since its revision in 2011, approximately 200 more turbines with a total nominal power of 588 MW were commissioned and constructed across Burgenland.

As of November 2014, the 400 wind turbines in Burgenland produce 2.1 billion kWh of electricity with an output of approximately 960 MW per year. This is matches the consumption level of nearly 600,000 households, and is equal to approximately 1.4 million ton reduction in CO_2 because of sustainable resources.[25] Upon celebrating the milestone 400th wind turbine in November 2014, Burgenland Governor Hans Niessl commented, "The power generation of 400 Burgenland wind turbines is remarkable. Burgenland is a great example of how fast the energy revolution can go."[26] In a period of less than 20 years, wind power development in Burgenland has grown expoentially. As a result, the local economy has benefited. 2014 wind energy development in Burgenland lead to: 1,200 construction jobs, 110 permanent maintenance and operations jobs (with support from local training programs), and a total €325 million in investment.

Figure 10[25 above]



Since 2013, Burgenland has reported that the state's annual total electricity generation when at full production and network capacity is higher than its household demand. Burgenland claims to be over 100% energy self-sufficient based on annual energy production and consumption quantities, as demonstrated in Figure 10. This idea is mostly anecdotal due to the necessary interconnection between electricity sources, the national transmission grid, and the regional distribution grid. What is produced in Burgenland is distributed elsewhere. Nonetheless, the expansion of wind development in Burgenland has been rapid and has yielded impressive results allowing to Burgenland to become an energy exporter and boost local economic development.

Because of its small population, dominant agricultural industry, predominantly flat and open natural landscape, and sustained economic growth resulting from meaningful multilateral financing and support programs, Burgenland has long been considered ideal for wind farm development since the late 1990s. Burgenland Governor Niessl has remarked, "When the winds of change blow, some people build walls and others wind turbines. Pure energy is to use energy sources that nature gives us voluntarily."[26] It is true that in addition to favorable natural resources, Burgenland's successful wind development is partly due to it being the only state with a legal and spatial basis for the construction and use of wind farms. Exactly how the development of wind farms and associated electrical grid infrastructure in Burgenland has come about is assessed in this report through exploration of relevant policies, siting considerations, and decision making processes. The next section provides a brief overview of the material and methods this report is based on. The following literature presents different aspects on wind farm development, including interview-based methodology, public-oriented approaches, financial considerations, and spatial perspectives.

Literature

To further understand the challenges and opportunities for wind farm development in Burgenland, the following literature is referenced. First, the use of qualitative expert interviews in a case study of renewable energy ownership types in Austria is examined. The master's thesis of a former NEURUS Fellow is then considered, focusing on the influences of regulatory risks on private investments in global wind energy. Next, articles referencing the inherent challenges of public opinion and public acceptance in wind farm development on are reviewed. In consideration of these reports, communicative planning practices are identified. Empirical research on wind farm development policy in Austria is then considered through spatial analysis and GIS application. The assortment of reviewed literature and multiple perspectives helps to fill a gap in knowledge and provides a more comprehensive view of the opportunities and challenges involved in wind energy development in Burgenland.

A case study supported by the WU Research Institute for Co-Operation and Co-Operatives (RiCC) examines renewable energy development in Austria and Germany by way of energy cooperatives and local ownership as social innovation processes.[27] Schreuer (2012) employs qualitative expert interviews to understand collective citizen ownership of renewable energy facilities. The report is based on nine semi-structured interviews with representatives of Austrian companies that have developed or are in the process of developing renewable energy facilities based on citizen ownership. The results of Schreuer (2012) provide important insights on wind farm development in Austria. The author cites national influences and conditions, including the Green Electricity Act, spatial planning, political commitments and lobbying, and citizen participation and ownership. Almost all interviewees report that the involvement of the local and regional population is of particular importance. In particular, the research suggests that Burgenland residents see the regional utility ownership of wind power as an indirect form of citizen ownership, further driving development. Lastly, Schreuer (2012) highlights the multitude of roles and relationships of businesses, support actors such as interest groups and expert organizations, utilities, municipalities, and citizen-oriented groups. Overall, the case study put forth by Schreuer (2012) offers a relevant interview-based approach to understanding the

dynamics of renewable energy development and ownership.

Łukasik (2014) investigates the real influence of regulatory risks on private investments in wind energy from the perspective of the international financial investment community.[28] The master's thesis provides insight on how regulators can influence the long-term risks that must be accepted when committing to a wind energy development project. Addressed are the real and perceived regulatory risks, the factors influencing a decision-making process when deciding upon different energy investments, and the extent that perceived regulatory risks can be minimized so that financing costs are decreased. Like Schreuer (2012), the in-depth interview approach used by Łukasik (2014) anchors the research and provides motivation for methodology of Burgenland wind farm development research. Building upon neoclassical economics, behavioral finance, and socioeconomics, the research determines that there is a mix of factors that influence the perception of regulatory risks among investors in wind energy. Namely, policy makers underestimate the role of public acceptance in increasing investors' resistance against changes in regulations or in governments. Some investors appreciate the involvement of local communities in planning processes, with or without their financial participation in the project, as a solid hedge against the Not In My Back Yard (NIMBY) phenomenon and regulatory risks. Łukasik (2014) recommends the further establishment of proper governance and informal institutional frameworks, such as responsible investing principles or strengthening energy consumer awareness. There are various non-financial factors and incentives affecting investment decisions in wind energy, which policymakers can leverage to minimize regulatory risks, lessen the burden on public finance, and attract investors looking for low-risk investments in capital markets. Hampl et al. (2012), as cited within Łukasik (2014), conclude that investors' willingness to finance wind power "megaprojects" is based on traditional risk and return factors as well as behavioral and social factors.[29] Managers of these large-scale wind power projects can influence investor acceptance either indirectly via tactical project management or directly through stakeholder management.

Brittan (2001) argues that visual influence is the most important factor in siting a wind farm.[30] Any changes to a local landscape are inherent to wind farm development, and thus must involve the public in policy design and throughout the decision making process. Limitations can stem from social acceptance, in addition to regulatory, technical, financial, and environmental issues. Similarly, Wolsink (2007) finds that visual evaluation of the impact of wind power on landscape values is the dominant factor in explaining why some are opposed to wind power and others support it.[31] Accordingly, Birnie et al. (1999) maintain that developers have to site wind turbines in areas of the highest wind resources to make any financial return, leading to landscapes traditionally valued for their beauty and remoteness instead being designated for wind farm development.[32] Hagget (2008) examines public perception for offshore and onshore wind farms, finding significant complexities in development, policy, politics, and planning.[33] Pertinent issues include environmental factors, visual impacts, spatial considerations, conflict with other uses, local social and historical contexts, ownership, and public participation.

To move past the deep-rooted challenges of selecting locations for the construction of wind farms, Wolsink (2007) argues that local-level communication problems, decision making processes, and attitudes must be examined. Rather than closed, top-down, and technocratic planning, collaborative approaches that build institutional capital should be employed in wind

farm development. This includes decision making processes, information dissemination, opportunities for the public to contribute their concerns, and possibilities for accommodation. Wolsink (2007) finds that because spatial planning and energy policy largely frame decision making, participatory planning can lead to better outcomes. The widely cited Wüstenhagen et al. (2007) identifies influences and strategies in the socio-political, community, and market acceptance of renewable energy.[34] As depicted in Figure 11, the social acceptance model of Wüstenhagen et al. (2007) distinguishes between three distinct yet interdependent dimensions: socio-political acceptance of a new technology (e.g. of the general public or policymakers), community acceptance (e.g. of the community and neighborhoods that are adjacent to infrastructure projects) and market acceptance (e.g. of consumers or investors). Acts of public participation are identified in the sections on Burgenland policy and within the stakeholder interviews.

Figure 11[34]

The involvement of the public in decision making and development, as seen in Schreuer (2012) and Łukasik (2014), informs the qualitative research approach for wind farm development research in Burgenland. Particularly, aspects of communicative planning theory are addressed within stakeholder interviews to gain insight on the siting considerations and decision making process. Communicative action reflects a variety of institutional, political, and power relationships within a mostly decentralized and non-rational approach to planning practice. Planning can implement communicative action strategies by working across multiple types and forms of knowledge and utilizing direct methods such as mediated negotiation, consensus building, and conflict resolution. In Forester (1989), communicative planners' responsibilities, influence, and concerns in local land-use conflicts can be served by mediated negotiation strategies.[35] Planners assure that the interests of major parties are legitimately incorporated, using informal or formal negotiations to produce viable agreements. Mediated negotiation strategies require distinct planning competences including sound communication practices, diplomatic skills, administrative and process knowledge, and the ability to deal with power imbalances. When local conflicts involve many issues or diverse interests, mediated negotiations

for planners are practical and can make work politically. Healy (1992) argues that we know little about what it actually involves or about the ethical dimensions of communicative work.[36] Planners must seek greater understanding of the circumstances, increase the overall quality of knowledge, make it available to the communities and stakeholders they serve, and understand ongoing power relations. Therefore, conflict and the potential for resolution require planners to address their contribution to the interrelated acts of knowing, valuing, and acting. Communicative planning has limitations, as some planning practitioners view it as more of a strategy than a planning theory, gains may be temporary, and efforts do little to affect the underlying differences in power structures. Nonetheless, the communicative planning paradigm offers certain parallels and applications to qualitative research of wind farm development in Burgenland. To understand the issue's siting considerations and decision making processes via stakeholder interviews, a base knowledge of the communicative planning framework is necessary. The research's association to communicative planning theory is further addressed in the methodology section. As public opinion towards wind power development evolves towards cautious acceptance, acts of communicative planning that focus efforts on the spatial aspects of sustainable land use is fundamental to continued progress.

Through a GIS based decision system for wind turbine site selection, a 2012 study analyzed the policy feasibility of Austria's National Renewable Energy Action Plan (NREAP) targets for installing 700 MW of wind power capacity until 2015 under the Green Electricity Act's feed-in tariff. Gass, Schmidt, Strauss, and Schmid (2012) developed a model for estimation of wind energy's technical and economic potential, and analyzed the cost efficiency of the implemented feed-in tariff support scheme.[37] The authors conclude that to meet national and EU targets through the deployment of wind power, the policy framework should lower the feed-in tariff; provide a gradual and stratified increase in feed-in tariffs to limit profits at favorable sites; incentivize additional development at marginal but economically, environmentally, and socially favorable sites; and minimize inefficiencies and losses from policy intervention. For the purposes of this research, the GIS approach of Gass et al. (2012) is more significant. Based on ecological, technical, and economic constraints, the authors found 5800 km^2 available for wind power production in Austria and that it is economically optimal to install wind turbines in the northern and eastern parts of Austria (just as investors have done). The GIS approach of Gass et al. (2012) is relevant, and will be partially replicated in this report's quantitative assessment. The authors utilized the following method for GIS:

- Identify potential wind turbine sites that comply with spatial planning policies and legal ecological restrictions.
- Identify technically feasible areas based on geophysical and environmental aspects. Excluded from site selection includes non-agricultural land, settlement areas, transportation networks, railway networks, protected areas, areas with a slope greater than 15°, and areas with an elevation greater than 2000 m.
- Identification of the economic potential per grid cell (100m x 100m) was identified by determining the wind power output at 100m height and calculating the LCOE based on costs relating to capital investment, operation and maintenance, and finance.[38]

Gass et al. (2012) relate their spatial analysis approach of wind energy potential to two categories of GIS applications, for understanding different stakeholder perspectives or integrating

renewable energy into regional energy planning through demand and supply management. The GIS spatial analysis in this report on Burgenland wind farm development leverages the former approach. Secondly, this report primarily utilizes the spatial attributes provided in Gass et al. (2012) relating to agricultural land, settlement areas, transportation and railway networks, protected areas, elevation and slope, resolution, and spatial projection. Gass et al. (2012) recognize the limitations found in their spatial analysis, including ecological, noise, and aesthetic parameters. The authors contend they are hard to quantify and generally unavailable across datasets. As a result, the study calls for future research to integrate biodiversity and social aspects into spatial analysis of wind power potential as soon as the data is made available.

The literature review presented here promotes a more comprehensive knowledge base of the issues, opportunities, and challenges facing wind farm development research in Burgenland. This has been accomplished through research of renewable energy ownership types in Austria, research methodology and interview-based approaches, the influences of policy and regulatory risks on private investments in global wind energy, the inherent challenges of public opinion and public acceptance, identification of communicative planning acts, and spatial analysis and GIS application in Austria. However, the aforementioned literature's does have limited exploration of the general concerns within electrical grid development for wind farms, the influence of multi-level (national, state, and local) policies, and meaningful site suitability analysis on wind farm development in Burgenland. This report attempts to contribute to applicable academic research and practical experience by filling in such knowledge gaps.

Methodology

Sustainability Frameworks Supporting the Research Methodology

No academic literature is available that centrally focuses on sustainable wind farm development in Burgenland. Rather, a report published by the World Wildlife Foundation (WWF) Austria extensively covers the subject. The examination of balanced sustainability efforts in WWF Austria's report is accomplished through stakeholder interviews is modeled for this research's methodology. The other model leveraged in this research is a reconsidered idea of the triple bottom line (TBL) of sustainability. Together, the WWF report and the revised TBL serve as a foundational model for why, how, and where wind farm development in Burgenland has occurred. These two models influence the research's qualitative and quantitative approach in the case study investigation, as both resources assist in setting up critical research questions and the data collection processes.

WWF Global and local affiliates abide to the following five principles on nature, energy, and climate protection[10]:

1. Global warming must not exceed 1.5°C (compared to pre-industrial temperatures). Therefore, WWF is strongly committed to climate protection.
2. In addition to sustainable renewable energy, the most important climate protection measure is the continuous reduction of (primary) energy consumption and thus of the corresponding emissions. Appropriate regulation and strict standards must be put in place to achieve the needed energy conservation and to improve the efficiency of energy

services.

3. WWF strongly advocates a 100% renewable energy future by 2050 with a broad mix of sustainable renewable energy sources.
4. Development and production of any renewable energy must comply with stringent social and environmental criteria. WWF calls for forward-looking spatial planning for all primary energy sources with exclusion zones based on nature conservation criteria to prevent negative impacts on endangered species and habitats. In addition to Environmental Impact Assessments (EIAs) of individual projects, transparent Strategic Environmental Assessments (SIPs) have to be conducted during the development of strategies, programs and major projects with early involvement both of non-governmental organizations (NGOs) and of the population affected. Thus any positive and negative impacts on the environment, people and society may be identified in time and taken into account.
5. WWF is committed to a sustainable energy supply for all. Efforts to eradicate energy poverty must be environmentally sustainable and socially just.

Under these parameters, WWF Austria has published "Burgenland – A Best Practice Example for Sustainable Development of Wind Power?" Their 2014 report examines general wind energy growth globally and in Austria, provides an ethnographic and energy-based overview of Burgenland, the best practice approach to the expansion of wind power in Burgenland, key factors leading to this development, and outstanding recommendations. According to WWF Austria:

> The aim of the study on which this report is based was to explore this development and to identify the key factors contributing to its success. That fact this region in eastern Austria is both an ecologically highly sensitive area and an important tourist destination makes this case even more interesting. Since the roll-out of wind power was achieved while accommodating all these various interests, valuable conclusions could be drawn on how to deal in practice with the tension between nature conservation (on a regional level) and climate protection (on a global level). These findings could serve as a guide for action for a broad range of actors in other regions…The present report is intended as a contribution to the debate on energy supply, nature conservation and climate protection within the global network of WWF. Taking a firm stance towards renewables is not always straightforward, but given the forthcoming challenges it is becoming something of a necessity. In this respect, some of the findings from Burgenland may be helpful.

WWF Austria accomplishes their study through in-depth conversations held over months with various stakeholders involved in the process, including policy makers, representatives of administrative bodies, businesses, conservation organizations, national parks, and special interest groups. The most important key factors identified by the WWF Austria report are:

1. Clear commitment of policy makers
2. Innovative planning instruments and interdisciplinary approach
3. Cooperation and exchange in workshops and workgroups
4. Positive attitude among the population towards investments in energy generation and nature conservation

5. Opportunity EU accession and support mechanisms
6. Positioning of conservation organizations

WWF Austria identifies the following recommendations:

1. Cross-regional planning
2. Integrated energy concept
3. Revenue sharing across municipalities

The WWF Austria's key findings and recommendations from the report are respected throughout the research process along with the revised TBL framework.

To reflect the true externalities of how sustainability and renewable energy systems should be approached in the face of climate change, the TBL must be reconsidered from its individual and only sometimes overlapping pieces. Figure 12 presents the traditional model of the TBL framework and Figure 13 presents an updated version to demonstrate how sustainability practices must change in order to minimize ecological losses and the severity of climate change consequences. Whereas environmental, economic, and social sustainability each entail special opportunities and challenges for achieving significant reductions in CO_2E and supporting vital ecological functions, the three pillars cannot be equated equally. The environmental pillar must be elevated to the dominant category, and the economic pillar must be incorporated into the social pillar. To maximize global society's efforts of slowing greenhouse gasses, an approach like that offered by Figure 13 must be considered. Naturally, this approach is also limited; it is reductive in its approach to cultural, political and governmental, spatial, and temporal matters. Despite these shortcomings, it is necessary to promote environmental and ecological sustainability to the top of global society's consciousness, from which all other social and economic actions must take into account.

Figure 12

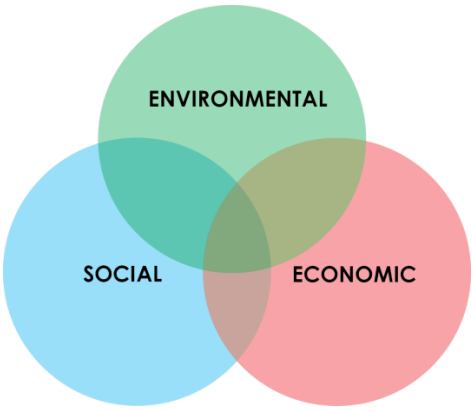
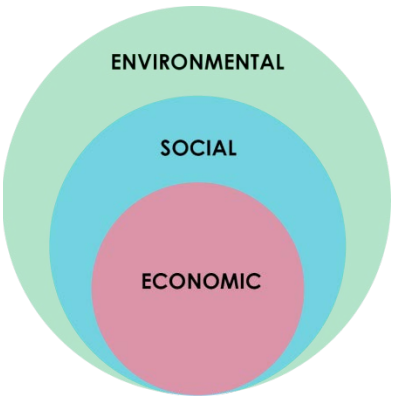


Figure 13

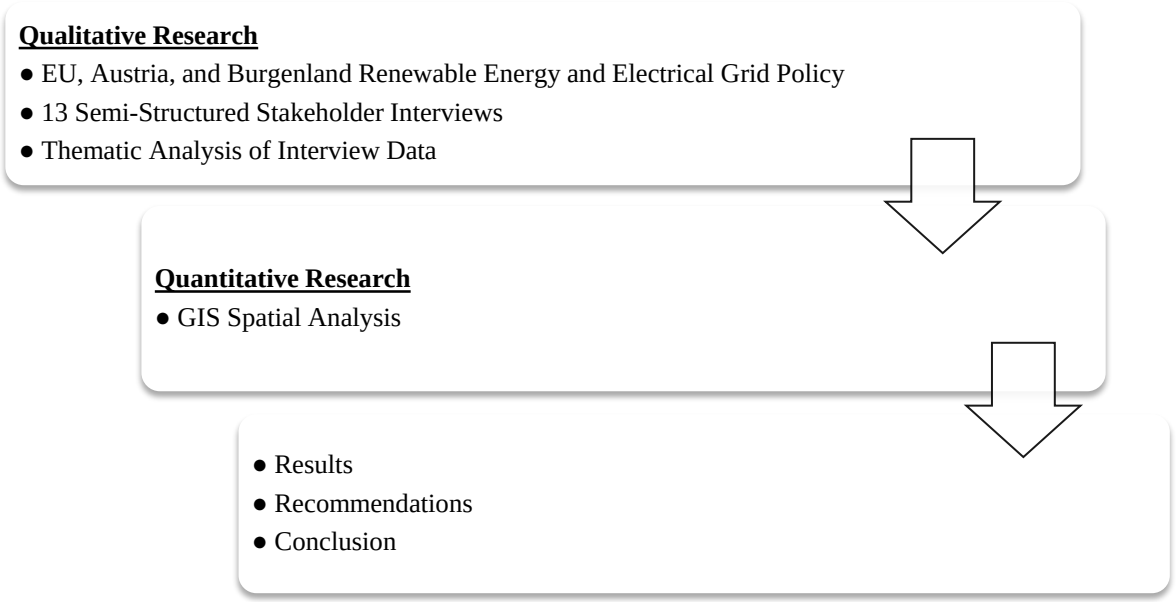


Qualitative-Quantitative Case Study Approach

This report is intended to provide a detailed understanding of how the development of wind farms and the associated electrical grid infrastructure has been pursued with the ability to balance

competing objectives of sustainability. Figure 14 provides a general overview of the qualitative and quantitative research methods used to support this examination. The WWF Austria model and the revised TBL paradigm are integrated throughout the research process, framing the stakeholder interviews questions and thematic categories, and informing the GIS application.

Figure 14



First, the most relevant EU, Austrian, and Burgenland renewable energy and electrical grid policies are explored. This is accomplished by using publicly available government documents and other information found online. By starting at the global level and zooming into the national and then local level, the qualitative and quantitative research achieves a better overall perspective and informational context.

Using this policy knowledge as a base, the study then utilizes thirteen semi-structured interviews conducted with stakeholders that have been included in Burgenland's wind energy development process. The diverse group of stakeholders represents the broad but necessary buy-in for a renewable energy system to be developed sustainably. Each affected party must be recognized as a stakeholder. Interviewees were selected on the basis of an internet search, policy exploration, and relevant news articles. See Table 3 for a list of stakeholder interviewees, position, organization, organization type, interview dates, and how the interview was conducted.

Table 3

Name	Position	Organization	Organization Type	Interview Date(s)	Conducted Interview
Michael Sorger	Department of Green Electricity and Energy Efficiency	E-Control for the Regulation of Electricity and Gas Industry	Federal Government	November 17, 2014	In-person
Gábor Wichmann	Department of Nature Protection	BirdLife Austria	NGO	November 18, 2014	In-person
Barbara Goby	Department of EU Environmental Policy and Environmental Law	Umweltdachverband	NGO	November 20, 2014	In-person
Helmut Maislinger	Commercial Legal Director Technical Department of Biology Senior Consultant	Energiewerkstatt Consulting GmbH (EWS)	Private	November 24, 2014	In-person
Elisabeth Stix	Office of the Federal Chancellery	Austrian Conference on Spatial Planning (ÖROK)	Federal Government	November 25, 2014	In-person
Viola Schubaschitz & Michael Haider	Management and Development	Energie Burgenland Windkraft GmbH	Private	December 1, 2014	In-person
Karl Schellmann	Climate Change & Energy Speaker	WWF Austria	NGO	December 2, 2014	In-person
Reinhard Pitzer	Managing Director	Püspök Group - PK Wind Farm Management GmbH	Private	December 3, 2014	In-person
Patrick Scherhaufer	Institute of Forest, Environmental, and Natural Resource Policy TransWind Research Project	University of Natural Resources and Life Sciences, Vienna	Academic	December 5, 2014	In-person
Florian Marimger	Energy, Economics, and Technology	IG Windkraft	NGO	December 9, 2014	In-person
Gregori Stanzer	Environment and Sustainable Energy, Tourism	Austrian Institute for Regional Studies and Spatial Planning (ÖIR)	Private	December 10, 2014	In-person
Johannes Schmidt	Institute for Sustainable Economic Development TransWind Research Project	University of Natural Resources and Life Sciences, Vienna	Academic	December 9 - 15, 2014	Email
Christoph Schuh	Strategic Corporate Projects	Austrian Power Grid AG	Private	January 7, 2015	Phone

The interviews were conducted from November 2014 – January 2015. One interview occurred over the phone, one interview occurred through email, and the others took place in-person. The length of time for each interview was approximately one hour. In one case, two interviewees took part in the interview; in all other cases, a single person was interviewed. Each interview was recorded and transcribed. Some additional information was gathered from the organization through their websites or with material provided during the interview.

The questions focus on interviewee experiences, knowledge, and opinions. A deductive reasoning approach is employed to understand interview data. The findings from each conducted stakeholder interview are organized into seven themes that underscore the different siting considerations and decision making processes. Interview data is analyzed within and across these thematic categories. The selected themes have been informed jointly by the WWF Austria key findings and recommendations and the revised TBL. The thematic categories are:

1. Advantageous location
2. Financial feasibility of development
3. Electrical grid infrastructure requirements
4. Environmental sustainability measures
5. Spatial planning methods
6. Stakeholder engagement and acceptance
7. Political commitment

A spatial analysis is then performed using the knowledge gained from relevant academic literature, wind energy and electrical grid policies at multiple levels of government, industry publications, and the stakeholder interviews. GIS is utilized to reflect the spatial relationship of Energie Burgenland wind turbines, specific area features, and required parameters for wind farm development.

While this report is not exhaustive, it does strives to represent real concerns involved in siting and decision making, including environmental, social, political, financial, technical, and logistical issues. To support this attempt at a comprehensive effort, the following research offers case study investigation at the federal state level of the policies, decision making processes, and

siting considerations involved in the development of wind farms and related electrical grid infrastructure. Following the study, the report identifies findings, recommendations, and considerations. The next section explores the international, national, and local policies that have indirectly and directly enabled strong and sustainable wind energy growth in Burgenland.

Policy Analysis

Energy policies of the EU, Austria, and Burgenland are first examined. Favorable renewable energy and electricity grid policies have led to acceptable wind energy siting and decision making processes. Strong policies at each level have enabled the rapid development of wind farms and associated electrical grid infrastructure in Burgenland. These policies provide and encourage financial support, ease coordination among cross-border stakeholders, lessen development's harmful local environmental impacts, and integrate competing sustainability objectives. The major international, national, and local policies that have enabled strong wind energy growth in Burgenland are considered, and inform the report's stakeholder interviews and GIS application.

EU Energy and Electrical Grid Policy

The Europe 2020 growth strategy for growth emphasizes smart, sustainable, and inclusive economic growth. These priorities are organized around objectives in employment, innovation, education, social inclusion, and climate/energy. To achieve climate and energy targets, binding legislation through the European Union's Renewable Energy Directive 2009/28/EC stipulates that Member States must attain the following shared climate and energy targets by 2020[39]:

- Reduce GHG emissions by 20% from 1990 levels
- Raise the share of total energy consumption produced from renewable energy sources to 20%
- Increase energy efficiency by 20%

Also known as the "20-20-20 by 2020 targets," the climate and energy package was agreed by Council and Parliament in 2008. EU leaders have a conditional commitment to scale up GHG emissions reduction for 2020 from 20% to 30% if other developed countries commit to comparable GHG emission reductions, and other economically more advanced developing countries contribute adequately according to their responsibilities and capabilities. To attain the 2020 targets, the Renewable Energy Directive mandates renewable energy source targets for each Member State, and requires them to establish national renewable energy action plans for development in the electricity, heating and cooling, and transport sectors. In October 2014, the EU agreed to the 2030 Framework for Climate and Energy Policies. By 2030, the new policy requires reducing GHG emissions by at least 40% below 1990 levels, increasing the share of renewable energy to at least 27% of EU energy consumption, increasing energy efficiency targets by at least 27%, reforming the Emissions Trading Scheme (ETS), and proposing a new governance framework based on national plans.

In accordance with the reporting requirements set out in the Renewable Energy Directive, the European Commission publishes a progress report every two years assessing the growth and use

of renewable energy, renewable energy policy development, and compliance with the Renewable Energy Directive. The first progress report was published in March 2013, in which 2010 figures indicate that the EU is on pace towards overall 2020 energy targets with a renewable energy source share of 12.7%. To promote renewable energy sources and reach 2020 and 2030 targets, the EU is utilizing the ETS, investing in renewable energy research and development (R&D), and improving the administrative procedures and funding mechanisms involved in the continent's electrical grid infrastructure. In addition to the 2020 and 2030 Renewable Energy Directive, policies are in place to grow Europe's wind energy sector. Important schemes include the European Wind Energy Technology Platform (TPWind), the European Industrial Initiative on Wind Energy (EWI), and Horizon 2020 - EU Framework Program for Research and Innovation.

Since 2006, the European Wind Energy Technology Platform (TPWind) has coordinated at the EU and Member State level, working with the European Commission, governments, wind energy professionals and associations, researchers, financial organizations, and the public sector. Objectives include identifying R&D priorities, targeting industry investment and public research funds, and growing the wind energy sector. TPWind works to ensure that wind energy continues to benefit Europe, grow cost-effectively, and become the backbone of Europe's electricity system, in the face of various political, economic, technological, environmental, and social challenges and frameworks.[44] Currently, the main deliverables of TPWind are the Strategic Research Agenda/Market Deployment Strategy (SRA/MDS), the European Wind Initiative (EWI), and a training report to assess the EU wind energy sector skills gap and the possible corrective policies. As noted in the March 2014 SRA/MDS, wind energy costs can be reduced by minimizing uncertainty and improving the predictability. TPWind suggests concentrating on five areas:

1. The development of new measurement techniques to capture all relevant design parameters for wind turbine design and siting;
2. Cost-optimization of wind turbine design by further developing in-depth knowledge of various external wind conditions;
3. Cost-optimization of wind farm siting and design by improving methods for atmospheric and wind farm modeling;
4. Cost-optimization of electricity system operation through improved wind power forecasting methods;
5. Standardization to ensure that research and new information is transferred efficiently to the market.

The EWI is one of the European Industrial Initiatives (EIIs), supported by the European Commission's Strategic Energy Technologies Plan (SET-PLAN). As found in other EIIs, this work pushes Member States, industry, and researchers to promote key energy technologies through shared funding, skills, and research facilities. Funding for wind energy R&D, which meets the EU's Strategic Research Agenda, is determined jointly by the European Commission, TPWind, Member States, and the European Energy Research Alliance. For the 2010 – 2020 period, the EWI has a budget of €6 billion: €3.1 billion (52%) from private investors, €1.86 billion (31%) from the EU budget, and €1.02 billion (17%) from Member States.[44] Should funding targets be met, TPWind estimates that the LCOE can be reduced over the next 20 years up to 50% for offshore wind energy and up to 20% for onshore, compared to 2008 levels. This

would make onshore wind the most competitive energy source in the EU by 2020 and offshore wind the most competitive energy source by 2030.[44] Similar R&D funding programs are identified.

Horizon 2020 is the newest structure of the EU Framework Program (FP) for Research and Innovation, operating from 2014 – 2020. The R&D program foresees almost €6 billion in the non-nuclear energy budget (an 8% share), resulting in a substantial increase compared to the previous FP structures.[44] See Appendix C for an overview of EU-Energy R&D Funding, from FP1 – Horizon 2020. Wind energy R&D activities were significantly underfunded for many years in the EU Framework Program, until FP7 (2007 – 2013) when the wind sector secured almost €169 million in grants and an additional €94 million via other FP programs such as FP7-People and FP7-Infrastructure.[44] In addition to funding schemes and supportive policies, new methods of planning and operating the electrical grid with high shares of wind power are needed. If this happens, wind energy can advance substantially and become a mainstream source of electricity. The Renewable Energy Directive, TPWind, EWI, and Horizon 2020, among other programs, necessitate several policies that will support Europe's modernized and cross-border electrical network.

A central factor of meeting renewable energy electricity targets is through investment in national and multinational electrical grid infrastructure, allowing for increased access of renewable energy. The first renewable energy directive in 1996 required that approximately 30% of the electricity market and 20% of the gas market had to be opened up to competition by 1999.[40] Market liberalization had several implications on energy transmission, distribution, and use. As a result of some Member States opening up quicker than others, an economic gap was created among nations in electricity rates for both medium-sized industrial customers and household users. Another reported issue was the electricity capacity bottlenecks between national networks, limiting the electricity available for consumption across markets.[40] Market liberalization has also reinforced the east-west European divide, holding back growth for uniquely challenged post-communist Member States. This affects the continent's overall ability to achieve EU 2020 objectives and overcome energy challenges.[41] To overcome such discrepancies within the spatial-economic structure and development of Europe, cross-border inter-connection targets and new energy providers may be able to promote equitable internal economic growth throughout Europe. One such policy is the EU Cohesion Policy: 2014 – 2020, which has resulted in expanded coordination and partnerships to achieve regional development policies such as those related to cross-border electricity grid development projects.

Realignment of the European electrical network is necessary. However, historically there have been administrative barriers, lack of clarity in planning, cumbersome permitting procedures, and disruptive changes to support schemes, raise regulatory risk for investors and limit improvements to the electricity grid.[42] Further electrical grid challenges from new renewable energy source are identified:

> Given the longer term expectations of the growing share of EU electricity coming from renewable energy sources, full implementation of Article 16 of the [2009 Renewable Energy] Directive is important. The current failure to modernize the grid as the energy mix is changing is causing problems for the development of the internal market, technical problems related to loop flows, grid stability and growing power curtailment, and investment bottlenecks resulting from delayed connection of new power producers.

> Adaptation of the electricity grid and system operation, including by improving storage capacity, better system controls and forecasting will improve the efficiency with which current infrastructure is used. And more efficient use and management of the grid can also avoid transport losses.[42]

Additionally, development in renewable energy electricity has further been negatively affected by the 2008 financial crisis. New possibilities in the energy electricity sector can occur as structural obstacles continue to be acknowledged, such as supporting cross-border inter-connection targets set by the European Network of Transmission System Operators for Electricity (ENTSO-E).[43] ENTSO-E plans to increase transmission line capacity by 64 GW by 2020, a 30% capacity increase in comparison to 2010.[44] Other supportive policy programs for the development of the European electrical grid infrastructure include can be attributed to the Trans-European Energy Networks (TEN-E)[45], the European Electricity Grid Initiative (EEGI)[46], and the New Entrants Reserve (NER300)[47]. As electric utilities expand to new markets, consumers will push harder for fair and affordable electricity services while political institutions will need to maintain their effectiveness through collaborative cross-border work. Most Member States have made some progress in addressing grid barriers in order to ensure the transmission and distribution of electricity from renewable energy sources, and the overall improvement of energy integration.[42]

The Renewable Energy Directive requires reforms of electricity infrastructure, operation, development, and the rules for renewable energy grid access and cost sharing (Article 16). Improvements are necessary for the equitable grid connection treatment of renewable energy and the proper integration of renewable energy producers into the electricity market, following the implementation of Member States' Ten Year Network Development Plan (TYNDP)[48] and the Projects of Common Interest (PCI) established under TEN-E regulation.[45] Measures include coordination and oversight of the permit granting process, setting minimum standards for transparency and public participation, and fixing the maximum allowed duration of the permit granting process (Article 13). Such advances will improve efficiency throughout the electrical system, from front to back-end processes. Reforms will also enable electricity generation development decisions to not be made in isolation.

In October 2013, the European Commission released a list of the first 248 PCI to benefit from streamlined permitting processes (faster environmental assessments and a maximum permitting process of 3.5 years), improved regulatory conditions, and a portion of the 2014 – 2020 €5.85 billion budget allocated to TEN-E projects under the European Commission's Connecting Europe Facility (CEF) funding program.[49] Documentation from October 2011 reveals the EU was originally planning to devote €9.1 billion to TEN-E projects through CEF, prior to austerity effort.[50] Of the 248 PCT, 140 electricity transmission and storage projects are included to upgrade the network and integrate renewable energy sources, and 100 gas-related projects.[51] The PCI list is updated every two years.

In addition to the 2020 and 2030 Renewable Energy Directive, policies are in place to grow Europe's wind energy sector. Important schemes include TPWind, EWI, and Horizon 2020. To realize such advances in wind energy, Europe's electrical networks are being modernized and reflect cross-border priorities. Improvements stem from policies and programs such as market liberalization, the Cohesion Policy, ENTSO-E, TEN-E, EEGI, NER300, TYNDP, PCI, and CEF.

For these EU level policies to be successful, there must be extensive Member State support and participation. Austria's energy and electrical network policy is now observed.

Austrian Energy and Electrical Grid Policy

The policy efforts put forth by the Austrian federal government reinforce binding EU 2020 and 2030 targets, support national renewable energy deployment and integration, remove regulatory risk, and increase investment certainty. The National Renewable Energy Action Plan (NREAP), Green Electricity Act, the Electricity Industry and Organization Act, and the Austrian Spatial Development Concept (ÖREK 2011) enable Austria to stay on the appropriate trajectory towards meeting Renewable Energy Directive targets. The follow section provides a brief overview of these influential national policies, which ultimately foster appropriate wind farm and electrical grid development measures in Burgenland.

Austria is required to reduce its share of GHG emissions to 16% below 2005 levels by 2020. Austria's NREAP, based on the Austrian Energy Strategy 2010, sets the overall trajectory, measures, and reforms necessary to meet the Renewable Energy Directive's targets. Austria has agreed to increase its share of renewable energy production to 34% of the total energy produced by increasing the volume of renewable energy and reducing the total energy consumption. Austria is one of three countries expected to reach 2020 renewable energy targets.**Error! Bookmark not defined.** The Renewable Energy Directive requires Member States to ensure that procedures for renewable energy are transparent, proportionate, coordinated, limited in administrative time for planning and permitting decisions, and facilitated for smaller or decentralized projects. Member States are required to report progress in addressing barriers to increasing the share of renewable energy; the European Commission can investigate the removal of these barriers and launch infringement proceedings when Member States fail to act.[42] To effectively promote renewable energy deployment integration, Member States must develop support schemes that reflect policy coherence and appropriate market interventions. In addition to the NREAP, existing Austrian policies and measures to promote the use of renewable energy include the Austrian Climate Protection Initiative (klima:active), Climate and Energy Fund Law (KLI.EN FondsG), and Environmental Assistance in Austria (UFI).

Austria's national energy and electricity strategy has been largely determined by national law. Austria's national renewable energy and electricity support scheme was first set in law in 2002, and amended in 2006, 2007, 2008, and 2012. The 2012 revision seeks to establish certainty and stability in the renewable energy market, thereby strengthening investments and increasing the likelihood of achieving national and EU climate and energy targets by 2020. The primary objectives of the 2012 Federal Act on Supporting Electricity Produced from Renewable Energy Sources (Bundesgesetz über Die Förderung Der Elektrizitätserzeugung Aus Erneuerbaren Energieträgern), also known as the Green Electricity Act, are identified[52]:

1. To promote the generation of green electricity in plants in Austria in line with the principles of European Union law;
2. To reach, at least, the identified shares of electricity produced from renewable energy sources: hydropower, wind power, solar photovoltaic (PV), and biomass or biogas
3. To ensure that green electricity production is energy efficient;

4. To make efficient use of the support funds for renewable energy;
5. To make the commercial maturity of green electricity generation technologies a technological policy objective, while bearing in mind European policies on renewables technologies in general and those contained in the Strategic Energy Technology plan;
6. To ensure a secure investment climate for existing and future plants;
7. To eliminate Austria's dependence on nuclear energy imports from the energy balance by 2015.

By 2015, renewable energy sources that receive support either through the Green Electricity Act or eligibility for investment aid are to account for 15% of the electricity supplied to consumers via public grids. To increase the amount of electricity produced from renewable energy sources, the Green Electricity Act calls for the construction of identified capacities for renewable energy sources. Between 2010 and 2015, 700 MW in wind power is targeted. Between 2010 and 2020, 2,000 MW of wind power is targeted, corresponding to an electricity output of approximately 4 TW. See Appendix D for detail of Green Electricity Act renewable energy targets. Initially, the 2012 Green Electricity Act offered €50 million in support funds for new green power plant contracts. This amount decreases by €1 million annually during the first ten years. Presently, wind power is annually allocated at least €11.5 million. Additional support funds of €80 million have been earmarked for the contracting of wind power plants for applications filled in accordance with the 2002 Green Electricity Act.[53] Should annual funds for power plant contracts not be exhausted during a calendar year, the residual amount can be used during the next calendar year.

The Green Electricity Act stipulates that the electricity generated from all registered "green electricity" sources is supported through a feed-in tariff (FIT) scheme. The green electricity FIT is designed to accelerate renewable energy investments by establishing long-term contracts and guaranteed grid access for accredited clean electricity producers. Austria's FIT offers wind energy generators a guaranteed cost-based electricity purchase arrangement for thirteen years. Annually, an ordinance is issued that sets the FIT amount for each source of renewable electricity, which can vary depending on a plant's capacity. The Minister for Agriculture, Forestry, Environment and Water Management, the Minister for Labour, Social Affairs and Consumer Protection, and the Minister of Economy, Family and Youth determine the FIT amount. For all wind energy, the tariff is set at 9.45 €¢/kWh if the application was submitted in 2013. The wind energy tariff is annually reduced by 1%, and so the 2014 rate is 9.35 €¢/kWh.[54] Tariff degression occurs as the FIT for new renewable plants can be gradually reduced to reflect the heightened level of adoption and the expected reduced costs for certain technology. See Appendix E for full detail on principles for setting the feed-in tariffs.

Operators of commissioned renewable energy plants, those accredited by the provincial governor of the federal province where the plant is located, are authorized to contract with the Clearing and Settlement Agency (OeMAG)[55] for the purchase, sale, and payment of feed-in tariff electricity. These energy producers are required to supply green electricity for at least twelve calendar months, and are obliged to join an OeMAG balance group[56] for green electricity purchasing obligations, processing, and administration. All plants have the right to be connected to the grid of the transmission system operator (TSO) in the area in which they are located. Energie-Control Austria (E-Control) ensures fair competition so that the TSOs treat green

electricity applicants equally and transparently, as well as monitor that guarantees of origin are correctly issued, transferred and cancelled. E-Control also monitors the degree to which Green Electricity Act renewable energy targets have been attained, which changes have taken place as compared to the previous years, rate impacts and consequences for consumers, causes of electricity consumption growth, discussion of policy options for reduction of consumption, and identifies developments impeding the achievement of these objectives. An annual report submitted to the Minister of Economy, Family and Youth and to the National Council highlights such developments and may include proposals for improving or adapting the FIT, support and aid schemes, and related provisions. Should Green Electricity Act targets be achieved ahead of schedule, the Minister of Economy, Family and Youth will initiate legislation to raise them.

Electricity traders are obligated to satisfy claims for the FIT, through monthly purchasing of green electricity quantities assigned to them by OeMAG at the transfer price set by law through the Minister of Economy, Family and Youth, and exclusively supplying domestic customers.[57] Costs of the feed-in-tariff scheme are passed on to consumers, who have to pay a fixed energy rate**.** After 2014, the rate is to be determined by the Minister of Economy, Family and Youth for three-year intervals. Until the end of 2014, the fixed green electricity rate is as follows:

- For users connected to voltage levels 1– 3: €35,000
- For users connected to voltage level 4: €35,300
- For users connected to voltage level 5: €5,200
- For users connected to voltage level 6: €320
- For users connected to voltage level 7: €11

Additionally, all consumers connected to the public grid pay a network level renewables contribution.[58]

The FIT is financed from the revenues made by OeMAG from the sale of electricity from renewable sources to the electricity traders. The revenue results from the difference between the market price and the higher price electricity traders have to pay. Electricity traders may pass costs to the final consumers the difference between the price they pay and the market price they charge. Other costs incurred by OeMAG are recovered through administrative fines, interest payments, and other income. Following the law's passage, the European Commission found the Green Electricity Act FIT scheme to be in line with EU state aid rules, specifically the 2008 Environmental Aid Guidelines.[59] The European Commission ruled in favor of the FIT because of it creates incentives for increased renewable energy, assists in meeting national targets, contains safeguards to minimize distortions of competition, and ensures that the subsidy does not lead to overcompensation of the additional costs for renewable energy sources. The financing structure of the scheme contains no exemption mechanism for energy intensive undertakings, and so the additional costs for producing green electricity are shared by all. The European Commission concluded that the Green Electricity Act financing mechanism does not involve any selective advantage for energy intensive users.

The second most important national energy policy stems from the Electricity Industry and Organization Act of 2010 and amended in 2013. This legislation provides the current legal foundation concerning energy networks and outlines Austrian electricity production and its

organization. The purpose of the Electricity Industry and Organization Act are as follows[60]:

1. To enact provisions on the generation, transmission, distribution, and supply of electricity, as well as on the organization of the electricity sector;
2. To regulate the system charges and provide rules on billing, internal organization, unbundling, and transparency of the accounts of electricity undertakings;
3. To lay down other rights and obligations of electricity undertakings.

Among the legislation's objectives, high quality electricity is to be provided at reasonable prices to the Austrian population and industry; the electricity market is to be in accordance with EU law and with the principles of the internal electricity market; the energy system and supply is to be secure and with a suitable framework; renewable energy sources are to be ensured access to the electricity system; and the wholesale energy market integrity and transparency is to be regulated appropriately. See Appendix F for question and answer on Austria's application of the Renewable Energy Directive's requirements and roles for electricity infrastructure development (Article 16, Section 1 and Sections 3 – 6) and electricity network operation (Article 16, Section 2 and Sections 7 – 8). Among those affected by the Electricity Industry and Organization Act include power plant operators, electricity suppliers, TSOs, OeMAG, electricity traders, balance groups, and control area managers.[61] Other Austrian electricity network policies affected by the Electricity Industry and Organization Act include E-Control's System Charges Order and Technical and Organizational Rules for Operators and Users of Networks. Spatial planning policy underpins the objectives of the NREAP, the Green Electricity Act, and the Electricity Industry and Organization Act.

The legal-administrative framework of Austrian spatial planning is three-fold according to the Constitution. At the national level, spatial planning primarily covers sectoral policies and planning if explicitly mentioned. This includes areas such as highways, railways, water, and electricity. At the state level, spatial planning instruments exist as a policy and programming agenda. There exist legislative and executive competences at both the national and state spatial planning level. At the municipality level, self-governmental rights exist in local spatial planning but under supervision of the related state. For example, municipalities have control via local development concepts, zoning plans, and building plans. Austria's spatial planning framework necessitates coordination and cooperation.

The Austrian Conference on Spatial Planning (ÖROK) was set up in 1971 as a political body, and is made up of members of the federal chancellery, federal ministries, state governments, the Association of Cities and Towns and the Association of Municipalities, and economic and social partners in an advisory function. ÖROK is responsible for coordination of spatial planning and regional policy among the different levels of Austrian government, through information exchange, research, policy recommendations, and implementation of a spatial monitoring system. ÖROK is primarily tasked with creating and further developing the Austrian Spatial Development Concept (ÖREK), a ten-year strategic spatial development steering instrument for all Austrian levels of government. ÖREK is primarily a voluntary policy agreement serving as a guideline for federal government actions and cooperation. Based on ÖREK principles and objectives, ÖROK partners are committed to cooperative and sustainable spatial development through planning and collaboration within Austria and Europe and across EU institutions.

"Space for all" is the motto and framework of the ÖREK 2011, with spatial development policy and planning based on four interrelated themes: regional and national competitiveness, social diversity and solidarity, climate change and resource efficiency, and a cooperative and efficient framework for actions. Within ÖREK 2011 the following factors of influence are considered: accelerated regional integration and competition; population growth and the increasing use of space for services and settlements; demographic changes and challenges to the supply of public and private goods; increasing energy consumption and threats to sustainability goals; climate change; overuse of natural and cultural resources and the resulting loss of regional biodiversity. Additionally, ÖREK 2011 considers binding EU frameworks (e.g. Alpine Convention) and national schemes (e.g. Austrian Strategy for Sustainable Development, Energy Strategy Austria, Austrian National Climate Change Strategy) in order to integrate strategies with the principles and measures of collective spatial development.

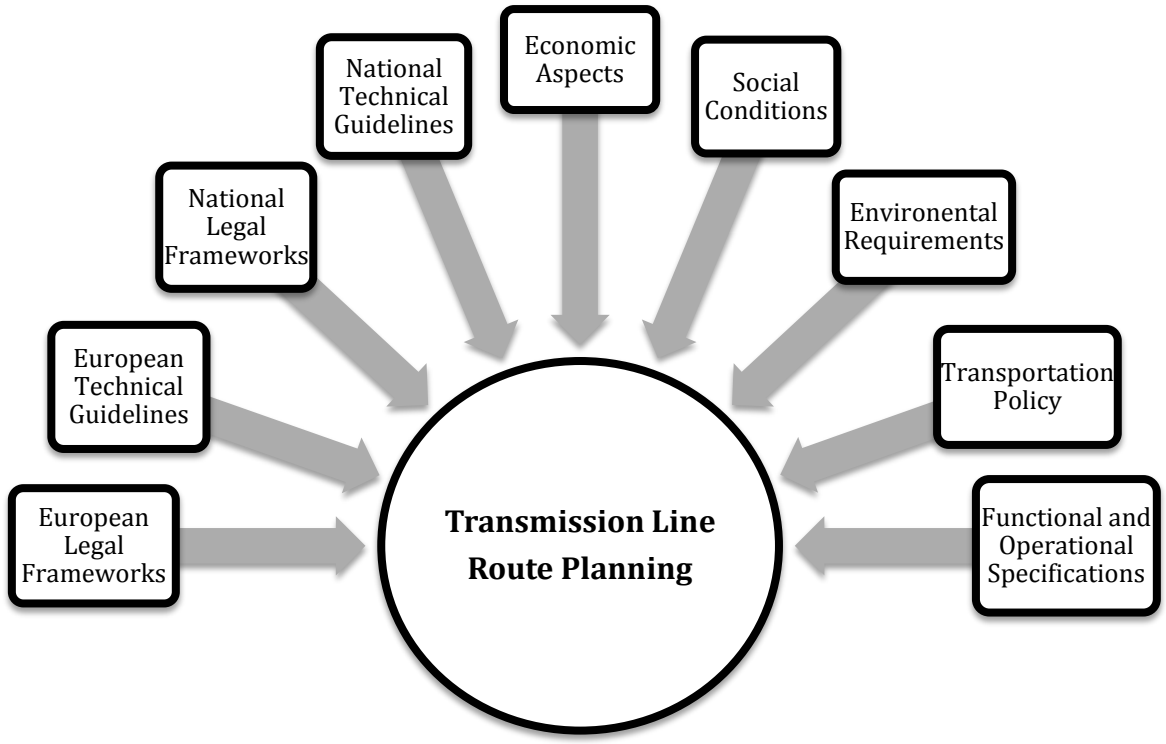
As clean electricity and climate change policies evolve within Austria, ÖREK 2011 promotes decreases in GHG emissions, efficient resource consumption, and environmentally and spatially sustainable planning and development. As stated in ÖREK 2011, "Energy systems exist in a spatial context and use spatial planning to improve energy efficiency." As a result, the resolution of spatial conflict is inherent to the framework. The Austrian spatial framework asserts, "Conflicts of interest may arise between economic, social and ecological objectives. These often 'uncomfortable' conflict of objectives must be addressed in political and planning decision-making processes, the consequences and the social and political significance objectively evaluated, and finally, solved by decision." The long-term spatial impact of climate change and the renewable energy system transition is identified within ÖREK 2011 objectives.

Distributed renewable energy development has multiple spatial contexts and is thus conflict-ridden. Stated within ÖREK 2011, "A low-emission and sustainable supply of energy requires a greater regionalization in the energy supply. Spatial planning should contribute to secure the key regional resources for renewable energy and the early avoidance of conflicts due to contradictory uses." Because spatial planning regulation can promote the optimal location conditions for renewable energy sources, defining and securing space for energy production and distribution is a central task of ÖREK 2011. To support distributed and regionalized renewable energy development, ÖREK 2011 cites the need for spatial planning of electricity grids. ÖREK 2011 contends, "The shortest distance between electricity generators and electricity consumers is to be aimed for in order to keep transport costs low and enable regional cycles. Spatial planning therefore must make a major contribution to securing routes." Sustained growth of Austria's economy requires long-term integrated location development and corridor planning.

ÖROK Publication No. 189 supports spatial planning efforts to secure space for electrical line infrastructure projects. The nature of this work is increasingly controversial due to intensifying pressure on land use and corresponding competing interests and plans. The study analyzes the relevant processes and laws, the system of rules and regulations, conflict of uses, identifies best practices and possible approaches, and makes recommendations. The solution proposals encompass transport route planning, approval, and operation; and strategic planning and possible ways of securing routes before initiating legal proceedings for the project. As part of the economic spatial development strategy to promote regional and national competitiveness,

Austria's electricity and energy networks are recognized as part of the country's "high priority" infrastructure. The framework behind ÖROK Publication No. 189 is identified in Figure 15.[62] Other spatial development actions identified by ÖREK 2011 include criteria-driven zoning of high priority areas for certain types of energy and energy efficiency; keeping grid routes free and ensuring their availability; leveraging energy master plans; and integration of multiple spatial and energy concepts. Spatial planning for energy necessitates the continued refinement and coordination of organizational, political decision-making, and implementation structures.

Figure 15[62]



As seen in the example of spatial planning for energy and electricity, ÖROK necessitates a participatory and stakeholder-driven approach to implementation of the ten-year strategic spatial development instrument for all levels of Austrian government. To support long-term and outcome-oriented policies, ÖROK requires adequate cooperation and management for regional, national, and international action in spatial development policy. Key spatial planning issues must integrate the knowledge and abilities from many partners. As determined in ÖREK 2011, "Multiple interests and objectives must be decided upon across the vertical and horizontal coordination of political levels, sectoral policies and departments, policy and administration, and the public and civil society side." Through ÖREK 2011, partnerships, support structures, and perspectives are continuously pursued to achieve sustainable spatial planning objectives. In this manner, proactive interaction leads to more efficient policy implementation and increased political acceptance.

To support the potential of active policies, including the NREAP, Green Electricity Act, Electricity Industry and Organization Act, and ÖREK 2011, there is ongoing movement to anticipate Austria's energy future. ENERGY 2050 is a strategic process for sustainable

development put forth by the Austrian Federal Ministry for Transport, Innovation and Technology. This work supports continuous discussion and collaborative activities that develop a long-term vision for energy, technology policies, and recommendations. 2015 conference events include Highlights of the Energy Research 2015 – Can an efficiency revolution be managed?, the annual European-wide Smart Grids Week held in Vienna, and Energy Talks Ossiach 2015 – Tools of the Energy Revolution.[63] To fully understand current and future energy and electrical grid policies, of both international and national scope, policy examination must continue at the regional level in Burgenland.

Burgenland Energy and Electrical Grid Policy

As previously demonstrated, Burgenland's status as a self-sufficient renewable energy generator and exporter is impressive. Burgenland was long energy-scare and dependent on energy imports. Thus, there was a long-standing desire to improve the state's energy supply. On June 8, 2006, the parliament of Burgenland decided that by 2013 the entire electricity needs of Burgenland would be produced with renewable energy. This objective was reflected in the title of the state's updated Land Development Program – "With nature to new success." Said Governor Hans Niessl, "We are determined to be a role model for Austria and Europe. Many laughed us out at that time, including provincial governors of other states. However, we were convinced that [this is] the right way."[64] Burgenland's success can partially be understood through its energy and electrical policy initiatives. Burgenland's commitment to wind energy is identified through spatial policy, regional development policy and accompanying financial support from national and international sources, and national electrical grid integration initiatives.

In Austria, wind farm siting decisions fall under the jurisdiction of the municipalities. It is up to the municipality to rezone properties for wind power plants or not. However, since 2002, Burgenland is the only federal state with a clear and firm legal basis for the use of wind power and for the construction of wind farms. Unlike other states, there is a significant legal-administrative basis for authorities, municipalities, wind farm operators, the public, and relevant stakeholders. Burgenland primarily supports wind farm projects authorization through the creation of a regional suitability zone framework for wind turbines. ÖROK's 2011 Regional Policy Framework for Wind Turbines is one such policy example of how Burgenland spatially plans for the sustainable wind farm development.

In addition to the mandate for action outlined in ÖREK 2011, ÖROK published the Regional Policy Framework for Wind Turbines in 2011. ÖROK's guideline for best practices in wind development is relevant for all wind farm development across Austria but is primarily focused on development in north Burgenland and the central area of Eisenstadt. Partner groups involved in the ÖROK Regional Policy Framework for Wind Turbines include the Office of the Burgenland Regional Government, State Office Directorate, Office of Regional Planning, Burgenland Regional Planning Advisory Committee for the Definition of Zones, BirdLife Austria, and the Austrian Institute for Spatial Planning. This policy instrument is intended to strengthen efforts in climate change adaptation, resource efficiency, energy-autonomous regions, and the spatial implications of energy systems including securing areas for production and distribution. The spatial process of identifying potential regional suitability zones for wind farms is identified.

According to the ÖROK Regional Policy Framework for Wind Turbines, suitability zones are defined conditionally. First, areas are defined that should remain free of wind turbines, including areas of urban development, landscape protection, World Heritage sites, certain birds species habitat protection, and areas of recreational or tourism importance. The remaining areas are examined in terms of the possible combined effects of wind farms. Finally, the effect of wind farms on settlements is analyzed. In this regard, the size and location of wind turbines are examined by means of their "dominance" and visibility. According to ÖROK's Regional Policy Framework for Wind Turbines, the designated suitability zones are sufficient to meet the renewable energy electricity needs of Burgenland. ÖROK argues that suitability zones are best understood in both a regional context and at municipal scale. Accordingly, Burgenland's regional development strategy is acknowledged.

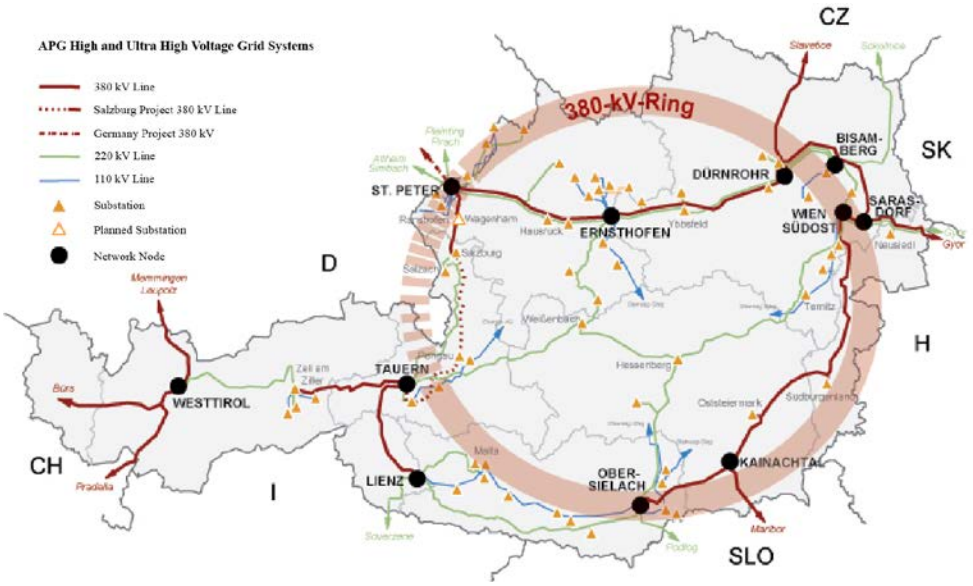
Through funding from the European Regional Development Fund and the European Social Fund, Burgenland is receiving € 72.3 million for its regional development strategy. Today, the Burgenland 2020 strategy calls for programming from 2014 – 2020 to meet the objectives outlined in Europe 2020; Austria's 2012 National Reform Program; ÖREK 2011; the 2011 Austrian Strategy for Adaptation to Climate Change; Austria's 2010 Energy Strategy; the STRAT.AT 2020 national cohesion policy and rural development objectives; Burgenland's 2011 Land Development Program (LEP); and Burgenland's Research, Technology, and Innovation Strategy.[65] With regards to renewable energy and associated electricity network needs, Burgenland 2020 objectives and desired effects include[66]:

1. Further development of renewable energy
2. Total energy consumption is to be supported by renewable energy by 2050
3. Expansion of advanced energy technologies
4. Development of new energy technologies and innovations
5. Linking different energy technologies
6. Ownership of decentralized energy supply and energy security within subregions
7. Promote local and regional value chains
8. Important energy sources include wind, PV and solar thermal unit, geothermal, biomass

Burgenland 2020 objectives also identify the need for dynamic sustainable uses in compliance with environmental principles and conservation. As stated, "The development of opportunities for coexisting resource use and nature conservation (e.g. wind farms) is central to the development of sustainable regional development."[66] In addition to such sustainable principles, renewable energy sources must be integrated with the national electrical grid network.

The Network Master Plan of the Austrian Power Grid (APG) identifies critical infrastructure projects, of which several are in Burgenland and support wind energy needs. The expansion of the 380 kV network strengthens Austria's energy supply through security and stability. As demonstrated in Figure 16, the 380 kV transmission line "ring" supports the integration of many distributed energy sources into the national power grid.[67]

Figure 16[67]



Geographically, the electrical grid supports interconnection and balancing across the country. Network infrastructure, including multiple grid capacities and substations, must be added or enhanced to support the integration and load balancing of primarily regional renewable energy production. APG Operations Manager Wolfgang Haimbl states, "The commitment to the promotion of renewable energies has led to a paradigm shift in the electricity supply system over the last 10 years…The main challenge facing the supply infrastructure lies in the harmonization of this new generation structure and electricity consumption."[68] In Burgenland, the local system operator BEWAG Netz GmbH is working with APG to achieve such changes. The following eastern Austria projects are most influential to Burgenland wind farm interconnection efforts and the ongoing modernization of the 380 kV line:

- Reinforcing the 380 kV line through third and fourth segment installation of the Dürnrohr – Vienna Southeast line[69]
- Commissioning the 380/110/30 kV substation in Zurndorf, which serves as a transfer node for wind energy generated in north Burgenland[70]
- Grid expansion of the South Burgenland - Vienna Southeast line through installation of additional sub-conductors (wires) to support transnational transmission capacities[71]

APG efforts are related to ENTSO-E standards, in which Member States must support grid expansion and renewable energy integration measures. The ENTSO-E Continental Central East regional group, which covers Eastern Austria and Burgenland, identifies further TYNDP strategies in the 2014 Regional Investment Plan. Overall, electrical grid development in Burgenland is the result of several regional, national, and international policies.

The development of wind farms and associated electrical grid infrastructure in Burgenland is supported by a range of policy initiatives. The ÖROK Regional Policy Framework for Wind Turbines, Burgenland 2020, and incorporation of APG objectives stand out as the leading local policies that underline historical and ongoing wind farm growth. Burgenland's energy and

electrical grid policy is additionally informed, directly and indirectly, by the national and international policies previously identified in this section. This extensive network of policy measures is a major component of understanding why wind farm development in Burgenland has been successful. The next section utilizes stakeholder interviews to understand the other key factors involved in the decision making processes and spatial considerations of wind farm development.

Stakeholder Interviews

The identified international, national, and local policies contextualize the report's qualitative and quantitative research. In this section, thirteen semi-structured stakeholder interviews are analyzed to further understand the decision making processes and spatial considerations involved in Burgenland's wind farm development. From the resulting experiential data, it is possible to draw conclusions about development challenges and successes. Throughout the interviews, stakeholders share professional perspectives and experiences. As described in the methodology and supportive framework, seven prevalent themes within Burgenland wind farm development are identified in the interviews:

1. Advantageous location
2. Financial feasibility of development
3. Electrical grid infrastructure requirements
4. Environmental sustainability measures
5. Spatial planning methods
6. Stakeholder engagement and acceptance
7. Political commitment

Thematic analysis of stakeholder interview data facilitates specific and insightful results. The approach works to comprehend the issue's multiple contexts, actors, and interactions. It serves to conceptualize and explore the key criteria for wind farm development found within interviewee reflections. Lastly, because interviewees share historical, contemporary, and prospective references, the thematic analysis approach helps to formulate a coherent narrative within and across themes.

The qualitative data in this report is comprised of individual and organizational viewpoints. As previously demonstrated in Table 3, interviews were conducted with federal government agencies, private wind and electrical grid developers, and environmental NGOs. Interview responses have been edited for clarity. Complete stakeholder interviews are located in Appendix G.

Advantageous Location

Burgenland is an ideal destination for wind farm development for various demographic, topographic, and geographic reasons. As previously identified, Burgenland is the least populous Austrian state, predominantly agricultural, and places a high value on its natural resources. This has created an expansive network of open space. This land area is also very flat. The urban areas are few, small, and developed compactly; very few residential buildings are located

remotely in the countryside. Next, Burgenland is located near Vienna, Austria's highest consumer of energy. This is enticing for electrical grid network operators as well as wind farm developers, who must help fund the development of new substations, underground wires, and infrastructure related to grid connection. All of these factors are contribute to why Burgenland is an advantageous location for wind farm development. Most notably, parts of Burgenland are among the windiest in Austria.

Clearly, wind farm development must occur in areas of high wind resources as it makes the project technically and financially feasible. How to utilize the area's wind resources is essential to understanding the theme of developing in an advantageous location. First, the role of wind resources in site selection and the decision making process is considered by three wind energy developers operating in Burgenland. Then, the influence of Burgenland's advantageous level of wind resources on the current and future intensity of wind farm development in the area is addressed by these stakeholders.

Wind measurement and its spatial implications are identified by two individuals in the management and development team of Energie Burgenland Windkraft GmbH, the largest wind developer and operator in the state. Viola Schubaschitz and Michael Haider state:

> Before you build a wind farm you have to take a wind measurement for 1 – 1.5 years. You need the [average] wind speed for the year to see if you build a wind farm in this place. If the wind speed is not high enough, then you shouldn't build there because you won't get enough profit…At the moment, we have a big measurement concept for each part of Burgenland using wind masts and LIDAR measurements. They are portable so we can transport it each month to a different area, so we can make a whole concept for a big region.

Wind measurement is a time-intensive process with significant implications for project financing and anticipating profit margins. Schubaschitz and Haider acknowledge the usefulness of wind measurements in project finance:

> The wind measurement is not only important for making the park layout, it's also for the bank because they want a perfect calculation before they give us credit or any contract. It's very important that we can pay the money back or not. Therefore, it's very important that we have perfect measurements and the calculation afterward with our guaranteed feed-in tariff. Then bank decides whether we get the credit or not. Normally when we make a wind measurement and we see the wind measurement is not good enough, we don't build a wind farm. This is a point which is non-discussable.

Collecting accurate and representative wind data is central to determining a site's suitability for development. Reinhard Pitzer, Managing Director of Püspök Group - PK Wind Farm Management GmbH, offers wind measurement alternatives:

> What we do is not always have a wind measurement because we have so many wind turbines that also deliver data. We take this data to also have a basis for our wind studies…There are other possibilities where you don't have to put up a 100m measurement tower for one year. You can take a LIDAR or sonar measurement for a few months, which is also representative and accepted by the banks.

Although it is important to have a base understanding of the area's wind resources, there must be sufficient rationale to go through with a complete wind measurement study. Wind measurement can be a costly process. Clearing the Environmental Impact Assessment and securing a location

in a suitability zone are major influences as well, as it will be determined in a later section, suggesting that it is better to wait before committing to comprehensive measurements. As identified by Pitzer of the Püspök Group:

> Wind measurement] should happen after a certain point in time when you are sure that permitting is somehow possible. Otherwise, you don't take €100,000 – €200,000 for the measurements.

For another wind farm developer, the decision making process is similar. Wind measurement is only applied after identifying and securing a suitable location, based on available low-impact space and approval from local authorities and the public. Helmut Maislinger, Senior Consultant and Managing Director for the Department of Biology at Energiewerkstatt Consulting GmbH, and development firm, states:

> Before you look at the wind conditions, you look at the space. That is easier to find out…You find a suitable space…You need the okay from the municipality, from the mayor… and from landowners…If you get their contracts with them, then you can fix the project. It's safe, more or less. No one else can come and say, 'I want to build my wind farm here.'

Because of its advantageous wind location and by way of these decision making processes, wind farm development has grown significantly in Burgenland. Compared to the rest of the state, north Burgenland has the highest level of wind resources. As a result, it has become nearly saturated with wind turbines. The current and future intensity of wind farm development throughout the state is reflected upon by Schubaschitz and Haider of Energie Burgenland Windkraft GmbH:

> There are for sure open spaces, but maybe not in the north because there are already a lot of wind farms. Only in the middle of Burgenland, in Eisenstadt or Oberpullendorf, there can be space. There is the question of what the next Green Electricity Act will be...When you have a bad feed-in tariff or no feed-in tariff and a bad wind situation, you can't establish anything. Therefore, only the north of Burgenland is really productive and also works well with a lower feed-in tariff.

Developing in areas with lower wind resources is possible but financially dependent on the extent of the current and future Green Electricity Act. Until more information on the revised Green Electricity Act comes to light, wind farm development in Burgenland will be on hold following completion of current projects.

As most wind farm development finalizes, at least temporarily, and the operation phase begins, Burgenland's advantageous location for wind is explored in other ways. Schubaschitz and Haider of Energie Burgenland Windkraft GmbH address their use of Burgenalnd wind conditions for testing of state-of-the art turbine technology:

> We have the two most powerful wind turbines in the world, the Enercon 126…We have them in Potzneusiedl, because you have a really [similar] strong wind situation about 20km from the sea in North Germany… We said we would make a test of the turbines.

The results of this R&D exercise have exceeded expectations for Energie Burgenland Windkraft GmbH. As turbine technology changes and wind resources remain moderate-to-high in Burgenland, the repowering of turbines may also emerge. In repowering, turbines are rebuilt,

ideally on the same site, with expanded capacities. This is primarily the result of technology and efficiency upgrades as well as taller towers and longer rotors. As these turbines reach new heights, they become capable of producing even more electricity. The implications of wind turbine modernization are addressed in multiple instances throughout stakeholder interviews. Repowering is one more example of how Burgenland's advantageous location for wind resources has even greater potential in the future.

Burgenland's high-quality locational attributes have been identified through the example of wind resources. This includes identifying developer's measurement and decision making approaches, the intensity of project development across the state, and the utilization of the area's wind resources for R&D and potential repowering. The combination of demographic, topographic, and geographic characteristics is a significant reason why Burgenland has been able to efficiently develop wind farms. The presence of high wind resources is a defining component of its advantageous location. The thematic analysis continues with exploration of financial feasibility.

For more information on Burgenland's advantageous location, see sections 2.3, 2.5, and 4.4 of the 2014 WWF report "Burgenland – A Best Practice Example for Sustainable Development of Wind Power?"[10]

Financial Feasibility of Development

Wind farm development draws from various public and private funding sources to make projects financially feasible and competitive with other energy sources. Stakeholder interviews identify the manner in which public policy mechanisms and private institutions influence project financing. Then, the need for market stability in wind farm development is addressed. Lastly, developers outline their decision making processes in land use agreements.

As identified in the section on Austrian energy policy, the Green Electricity Act is a highly influential policy because it supports renewable energy sources through a feed-in tariff and preferential grid deployment. E-Control is the Austrian authority responsible for electricity and natural gas regulation. As the public regulator, duties include establishing market rules and frameworks for competition, regulating network tariffs, identifying and remedying competition violations, and tracking and analyzing market development. Michael Sorger in the Department of Green Electricity and Energy Efficiency at E-Control remarks on the success of the Green Electricity Act:

> The biggest driver in Austria is the support system itself, depending on how high the feed-in tariff is. The money is limited. Every year, all the money is spent. The feed-in tariff could be lower and still all the money would be taken.

The feed-in tariff applies to wind energy development equally; it doesn't distinguish between sites. However, Burgenland's strong wind conditions creates more full-load hours compared to other locations, and therefore these projects receive more public financial support overall. Sorger then addresses the process wind farm developers must go through to receive Green Electricity Act benefits:

> You apply as a green electricity producer for the feed-in-tariff, and there is a certain amount of money that

> is distributed each year. Then, the producer sells its electricity directly to the green electricity company OeMAG. This central company distributes to all electricity traders in Austria. If [electricity traders] want to supply electricity to final customer in Austria, [they] have to take a certain share of [feed-in-tariff] supported renewables.

Because of the current support scheme, electricity traders must prioritize renewable energy sources over traditional electricity sources. Pitzer of the Püspök Group elaborates further:

> The feed-in tariffs and the promotion system is very important…The renewable energy has to be taken off before any other energy or electricity generated from other technologies. That is the advantage we have and benefit from. The utilities first have to take us, and then the gas, oil, and other energy forms

In addition to public policy funding mechanisms and private equity sources, banks have a significant role in project development. As identified in the previous theme, European banks require at least one year of wind measurement to support project financing. Securing a favorable loan will greatly influence implementation the entire project. This can include the scale of the development, decision making related to purchasing turbine components, land leasing, and construction. Additionally, financial institutions can influence the stability of energy markets, as Karl Schellman of WWF Austria argues:

> What is also a very big and important area, which is often not seen, is the whole finance system because there is no big power plant built without any international credit involved. The criteria that these international financing agencies are applying to their loans are very important. We did a lot of work…with the European Investment Bank (EIB), the biggest bank in the world…We tried to convince them to have more strict criteria for their energy projects, which was partly successful. The EIB now has a carbon intensity limit…We still would like to have it lower."

Should EIB financing structures for energy projects continue to incorporate more sustainability parameters, it will become easier for renewable energy projects to get off the ground as well as become competitive with other energy sources. As identified, the financing system impacts the course of development for a single project. On a macro level, the public and private financing system has the ability to change the competitiveness of renewable energy sources and thereby influence market stability. Should renewable energy sources continue to be supported through various policies and market mechanisms, and traditional fossil fuel sources fall out of favor as their negative externalities are accounted for, clean energy market stability can be accomplished. This then leads to sustained deployment, greater profit margins for renewable energy ventures, and advancements in R&D. The influence of Austrian policy on market stability is addressed by Pitzer of the Püspök Group

> The atmosphere in the field of business was never that stable in Austria. It was always kind of a 'hop on, hop off situation.' A lot depended on the incentives given by the Austrian state, as it is in every other state. Here, we had quite an unstable situation. We had a feed-in tariff for one year but then didn't know what happens the next year. You didn't know which investment you should take in the project development. That has changed in the past two years, where the government decided to fix the conditions for two years. But at the end of next year [2015], we are in the same situation again where we don't know what happens next.

The unpredictability of the national Green Electricity Act contrasts with the consistency of Burgenland's Regional Development Plan. Gregori Stanzer, of the private Austrian Institute for

Regional Studies and Spatial Planning, was one of the architects of the Plan. Stanzer states:

> The wind energy companies could rely on this zoning and the results. They respected it and could rely on it. Later on, when they had to go to federal state departments, it was much easier for them to get a 'yes' for permits.

Establishing stable decision making conditions has propelled wind farm development in Burgenland. Still, new challenges in national energy policy are on the horizon. For now, any wind farm built before the end of 2015 has thirteen years to utilize the feed-in tariff and its associated advantages. Provided that a suitable site and project financing have been secured, there is guaranteed income for these wind farms. Should the feed-in tariff component of the Green Electricity Act be terminated at the end of 2015, as it is planned now, renewable energy producers will then need to adjust their approach for selling electricity without guaranteed purchasing. Any wind farm developed after 2015 therefore must be financially and operationally structured in a completely different manner, affecting the project entire development. As stated by Sorger of E-Control:

> The guidelines say there won't be any fixed feed-in tariffs in the future for new installations. It's going to be crucial for new wind parks and all other new installations to develop a new way how to market electricity in the future. Now, they don't market it. They just sell it to OeMAG.

How contracts are established with landowners for leasing or purchasing is another important element for understanding the financial feasibility of wind farm development. One such approach is identified by Schubaschitz and Haider of Energie Burgenland Windkraft GmbH:

Most of the time we have 25 years [leasing]. There are companies on the market that have 50 years. It depends on who made the contract. Normally, we say the wind turbine is [in operation] for 20 – 25 years…The paved area [the turbine foundation] is fixed and the farm owner cannot use it. Here, you get 1.12 €/m^2. The diameter of rotor blades is the wind-swept area. For this first wind-swept area, you get 0.37 €/m^2. For the double wind-swept area [twice the diameter], you get 0.12 €/m^2…The payment is annual...When the turbine is on two properties, two or three farmers [may] get money for the same turbine [foundation] and the wind-swept area…Properties in Burgenland are often very small. You have many properties for a whole [wind] farm. When you have a big farm, you can have 200 landowners or more.

In addition to the contracts and pricing of the turbine foundation and wind-swept areas, terms are worked out for access roads, construction cranes, and cabling. The Püspök Group uses a fixed amount for the entire turbine and a separate amount for the permanent use of land. Pitzer identifies the financial rationale behind this approach:

> The total amount is based on market pricing, meaning, that as the availability of locations has reduced in the past 4-5 years, prices have risen by almost 100% to this level right now.

Although financial feasibility for wind farm development is an extensive and often complicated procedure, this section attempts to identify the most influential factors and decision making processes. As identified here, this is comprised of public and private funding mechanisms, the need for market stability, and the establishment of contracts with landowners. Closely related to

financially feasibility is the topic of wind turbine and electrical grid components. The thematic analysis continues with investigation into these physical structures and their various requirements.

For more information on the financial feasibility of development, see section 3.4 of the 2014 WWF report "Burgenland – A Best Practice Example for Sustainable Development of Wind Power?"[10]

Electrical Grid Infrastructure Requirements

In this section, interviewees identify the requirements that the electrical grid has for integrating and utilizing wind energy throughout Austria. First identified are the network capacity challenges that wind energy has created, changing the structure of the national electrical grid. Wind farm developers then address the manner in which the electrical grid is integrated into project development via siting and decision making factors. This section promotes greater understanding of electrical grid infrastructure and operation pertaining to wind farm development in Burgenland.

APG is the only company authorized by law to manage and balance Austria's 6,500 km of high-voltage (220 kV) and ultra-high voltage (380 kV) transmissions lines. As seen in Figure 16, APG is responsible for the well-being of the national transmission "ring." Distribution lines lead from the transmission ring to the high demand areas. These distribution lines operate at lower voltages and are managed by each area's regional power company. APG has historically not been responsible. The expansion of wind energy is posing special challenges for APG and the regional power companies. Christoph Schuh in Strategic Corporate Projects at APG reflects:

> The huge necessity of the integration of new wind is coming up to us because the capacities which are needed are [only] possible in our grid and not in the regional grids. For example, every Federal State has a regional grid company. In Burgenland, it is Energie Burgenland. But the capacities of the regional grids, especially in Burgenland or Lower Austria, are not enough to integrate the produced wind [energy] into their grid…In general, the wind power in Burgenland is going directly in the national grid and not in the regional grid.

Because regional grid capacities are not enough, APG is adjusting their strategy. Schuh remarks on the efforts of APG and Energie Burgenland (the regional power company unbundled is from Energie Burgenland Windkraft GmbH):

> There is a long process going on between the planning business units from Energie Burgenland and APG…We always coordinate our investments and try to figure out what is the best technical solution for the demand that is going on. We have a forecast which is going 10 -15 years because of the investments which have to be done.

Such coordinated efforts benefit APG, the regional grid companies, and local wind farm developers. Schuh continues:

> We made a new line through Burgenland. It was opened in 2000…It is a 380 kV line is going through Burgenland…This was also necessary because of the need for capacities for renewables. This was one of the projects supported by Energie Burgenland. We are in general discussions with IG Windkraft [Austrian

> Wind Energy Association]…There are permanent meetings every 3 – 4 months where we talk about regional development and regional potential decisions which have to be made…The hard facts, the hard planning, has to be done and has to be made with the regional electricity company. We have a very good relationship in general discussions and in general handing of the wind integration.

The changing needs in electrical grid infrastructure and operations necessitates greater interaction between APG, Energie Burgenland, and wind farm developers. As these measures to expand grid capacity are implemented and also reflected within the EU-mandated TYNDP, APG and the regional grid companies are having considerably better results planning for intermittent wind energy integration and load balancing. Fortunately for wind energy in Burgenland and Austria, national and regional grid locations are mostly sufficient as is. The country's small size is advantageous in this regard. In comparison, Sorger of E-Control states:

> There is enough capacity to get the wind from the eastern part to where it is needed in Austria. The load centers are pretty close. You don't have big distances where you have to transport the electricity. In Germany, it is a big problem to get it from the north to the south, and so they most often go east. There isn't enough [grid] capacity, so [generated] wind [electricity] takes the path of least resistance. It goes to Poland and then back to Germany in the south.

Grid connection greatly affects wind farm siting selection and decision making processes. Maislinger of Energiewerkstatt Consulting GmbH briefly outlines the process and its inherent concerns:

> Early in the planning phase [the developer] contacts the [regional] grid operator…You have to tell them, 'I have a project with about 20 MW and I need the grid connection for this project.' One of the most important things is to get the information 'Yes, you can connect to the grid' and the point of location where you can connect to the grid. The cables from the grid connection point to the wind farm need a permit…One of those is the permit process concerning the Umweltverträglichkeitsprüfungsgesetz (Environmental Impact Assessment).

Securing a grid connection point and working through the various associated environmental impacts is vital in the early stages of wind farm development. Generally, wind developers have greater interaction with the regional grid operator than APG. Wind developers must take into account the extent to which the grid reaches a potentially developable site in order to make integration possible. If the necessary infrastructure is not there, it must be developed at the cost of the wind energy company. These costs cannot be financed by the feed-in tariff. This generally includes the development of underground wires. Sometimes new substations must be developed, in order to transform the produced wind energy into a power level suitable for transmission. Because the cost of a substation is so high, at times multiple wind farms developers have worked together to establish the shared infrastructure and have it suitable for multiple projects. Collaborative development is explored by Pitzer of the Püspök Group:

> In Burgenland for our project, the last phase of development for our wind farm project was intensive…We sat together with the utility. In Burgenland, Energie Burgenland is the utility on one side. On the other side, they are the largest wind farm operator in Austria. It was their interest to have something [a substation] there. We sat together with them and a handful of developers, and asked them how we can find a way to get the electricity to the grid.

In this case, the Püspök Group, Energie Burgenland Windkraft GmbH, and Energie Burgenland

supported the construction of two substations for wind power integration. Like other utilities Energie Burgenland has been unbundled into multiple electricity sectors, with generation and distribution business officially separate. Energie Burgenland must work with all wind energy companies to secure access to the regional grid, and operates on a first come, first serve basis. Even still, other wind energy developers are concerned that the utility and its wind development branch are still too tightly integrated. Maislinger of Energiewerkstatt Consulting GmbH considers how this conflict of interest may play out:

> If you say, 'I have a potential site here and I want a grid connection there,' the information will go directly to the sister [company] of the grid operator. If you don't have contracts for the area, for the plots, for the owners of the grounds, or…with the municipality or the mayor, you have lost your project before you get the grid connection. They are talking and giving information to the sister [company], and they [then] try to make the contracts there…You really have to be careful when you say what, at which time do you give out information, and to whom…Normally, it would be better to tell the grid operator early on. But the developers can't really do that if they have not fixed the contracts. Otherwise, they lose their projects.

The counter perspective is that Energie Burgenland must abide by EU unbundling protocol. Secondly, any affiliation with Energie Burgenland Windkraft GmbH may bode well for other wind developers because the utility is naturally receptive and interested in expanding wind energy. For example, the substation in Zurndorf is managed by APG but has consistent support from Energie Burgenland. Schuh of APG elaborates on the cohesiveness of Burgenland's influence in the national electrical transmission and distribution system.

> Nearly 80 – 90% of the wind of Burgenland is integrated into our grid…The demand of electricity in Burgenland is not quite enough in comparison to the amount of the electricity which is produced in Burgenland. We have to put [the generated wind energy] from Burgenland away into, for example, the high demanding areas of Austria like Vienna. Or, on the other hand, for storage reasons into the pumped storage plants in the Alps.

Because wind power is intermittent, energy storage technology is an emerging option that could enhance the efficiency efforts of the transmission and distribution system. Schellmann of WWF Austria argues in favor of storage as well as smart grid technologies and efficiency measures. He states:

> In the past, [the electrical grid] was just built for the few big power plants. They were built in such a dimension that [the electrical grid] never had any problems with it. Now, we find out that we have to efficiently use it… For the whole energy transition, we need more grids but first we have to use what we have properly.

Integrating such measures will support the growth of wind energy and other intermittent energy sources such as solar PV. Additionally, it can slow the development of land for transmission line purposes. The limited use of these applications currently means that electrical grid operators maintain significant control over wind energy potential. When and how much generated wind energy can be integrated into the grid is a still a matter of available line capacity. Even with the Green Electricity Act's preferential treatment for renewable energy sources, wind energy is being curtailed when its output is too high for the grid. The need for storage, smart grids, and efficiency is a global phenomenon. Stakeholder interviews enable greater understanding of how electrical grid infrastructure requirements connect to the policies, spatial considerations, and decision making processes involved in Burgenland's wind farm development. Environmental

sustainability is examined similarly.

Environmental Sustainability Measures

Biodiversity and habitat conservation are highly valued in Burgenland, including Lake Neusiedl, the Leitha Mountains, the Parndorf Plain, and the Leitha lowlands. This is central to understanding how and where wind farm development takes place there. Stakeholder interviews address how environmental sustainability is upheld by way of specific policies, siting considerations, and decision making processes. The Regional Policy Framework for Wind Turbines and the Burgenland 2020 Regional Development Strategy are regularly cited in the stakeholder interviews as the most influential local policies that promote environmental sustainability. The EU Bird Directive and Habitat Directive are impactful as well. Additionally, Lake Neusiedl of north Burgenland and western Hungry is recognized by UNESCO as a protected world heritage site for the significance of its cultural landscape. Each of these policies influence where and how wind farm development can occur in Burgenland.

The concerns put forth by environmental NGOs are directly integrated into determining the suitability zones for wind farm development. Barbara Goby, from the Department of EU Environmental Policy and Environmental Law at Umweltdachverband, shares her organization's perspective:

> Our position is that, in general, we say yes to wind farms but there are certain conditions…What is most crucial to us is where it is located…We have worked out criteria for certain 'no-go' areas…The most crucial environmental aspects are concerning migratory birds and bats. What is also a big problem is…to protect the scenery and not to have the wind farms in central lines of sight. We say 'no-go' areas should be the nature protection areas [relating] to the nature protection laws of the states of Austria.

Achieving balance between environmental welfare and renewable energy is inherently a difficult process. Goby states:

> We are saying that we are not against [wind farms] because we have to have renewables. We can't say no, no, no. It's like a differentiated position. 'Yes, but under this and that condition.'…It's always a compromise for environmental matters.

Goby contends that balance can be achieved should other measures be implemented as well. This includes energy efficiency; renovation of existing sites; and turbine development only when truly necessary, through strategic planning and the involvement of public stakeholders. The "no-go" areas that Umweltdachverband has advocated for are supported by the other environmental NGOs in Burgenland and Austria. Gábor Wichmann in the Department of Nature Protection at BirdLife Austria describes his organization's process for defining the most important environmental criteria:

> We selected the species which were important in the area and affected by wind power plants, so we got some sort of priority list. From this priority list, we were able to zone it as the most important areas for these species. We tried to get an idea where the areas do not want wind power plant. Another way was to look at the most important roosting places, migration routes, or some exchange between two important roosting places…In eastern Austria, the Imperial Eagle, White-Tailed Eagle, Red Kite, Saker Falcon are the bigger species in these areas.

The objectives of environmental organizations have mostly been implemented in Burgenland wind farm planning, but the situation is always changing. Current and accurate environmental data takes a long time to derive. BirdLife Austria is in the midst of completing their biggest bird migration assessment to date. These evaluations are important but complicate the development process. As environmental data changes, so too does the impact assessment for wind farms. For now, Burgenland wind farm zoning areas are clearly identified, promote environmental sustainability, and are respected by wind developers. Florian Marimger of IG Windkraft (Austrian Wind Energy Association) states:

> They have a very very strict processes in the approval phase for the Environmental Impact Assessment. The environment, landscape, and birds are a huge issue. It's very strict in Burgenland.

Within the interviews, wind farm developers further confirm that current environmental standards are important. Maislinger of Energiewerkstatt Consulting GmbH responds:

> If we think or if we know that a certain site or a wind farm will make serious ecological problems, we will talk to the NGO which is affected. If birds are the topic, most often we will talk to BirdLife or they will come to ask the developer.

The integration of environmental sustainability into wind farm development were identified through the experiences and perspectives of stakeholder interviewees. It was shown that Burgenland's environmental policies were significantly informed by the work of local environmental NGOs. The result of such policy development is that the siting considerations and decision making processes of wind farm development becomes more objective and transparent for all stakeholders. The next section identities the spatial and land use factors that influence wind farm development. Undoubtedly, these factors are partly shaped by the environmental sustainability measures identified in this section.

Spatial Planning Methods

Burgenland's designation of wind turbine suitability and exclusion zones is well-designed, by way of comprehensive siting requirements. Since the start of wind farm development in Burgenland, there has been a coordinated effort to maximize the sector's growth while minimizing the impact of turbines. Burgenland's spatial planning methods achieve a high level of transparency, stakeholder inclusion, and functionality in managing the area's wind farm development.

Compared to all other federal states, the Burgenland government took action early and sought out assistance from prominent stakeholders in devising its spatial planning methods. Stanzer of the Austrian Institute for Regional Studies and Spatial Planning recalls the initial response of the Burgenland government regarding wind farm development in north Burgenland:

> Starting from the beginning, there were many projects building around the Parndorfer Platte [Parndorf Plain] area. The Environmental Agency of Burgenland [Umweltanwaltschaft] said, 'There are so many projects right now. We can't evaluate one. We have to look at the whole surrounding [area] of the projects. There must be a regional concept and a regional evaluation.'…The federal state of Burgenland asked us [ÖIR] if we could do that.

Each state has an Umweltanwaltschaft or Environmental Agency that legally advocates on behalf of environmental causes, organizations, and stakeholders. In Burgenland, Hermann Frühstück leads the Umweltanwaltschaft. Since the start, the Burgenland Umweltanwaltschaft coordinated with the Austrian Institute for Regional Studies and Spatial Planning, IG Windkraft (Austrian Wind Energy Association), BirdLife Austria, and other relevant interest groups.
Patrick Scherhaufer, of the TransWind Research Project in the Institute of Forest, Environmental, and Natural Resource Policy at the University of Natural Resources and Life Sciences Vienna (BOKU), reflects:

> One argument about the zoning and how they have done it in Burgenland…They are analyzing a small area in detail. Then, [they are] finding a compromise between different [stakeholders], issues, or perceptions...They won't say the animals are much more important than producing electricity, or whatever…They tried to handle this issue in Burgenland very sensibly or sensitively.

The timely and nuanced way in which the Burgenland government worked with stakeholders to determine spatial requirements and limitations for wind farm development stands out in comparison to other federal states. This is especially true for Lower Austria where permitting has begun only recently. By contrast, the Burgenland government and stakeholders worked out spatial designations prior to the boom of wind farm development. Elisabeth Stix, from the Austrian Conference on Spatial Planning (ÖROK), a federal agency, identifies the important spatial policies in Burgenland's wind farm development:

> The wind power program from Burgenland is a regional level strategy…There you have the law, Burgenländisches Raumplanungsgesetz [Burgenland Spatial Planning Act]. Then, the zoning type which you need to build the wind power, the Grünfläche Windkraftanlage [Wind Turbine Zoning]. Then, you have the law which is responsible for spatial planning, Land Development Program 2011. Then, you have the zoning type which allows you to build wind turbines, the Regionales Rahmenkonzept für Windkraftanlagen [Regional Policy Framework for Wind Turbines]… Also [included] is the distance measurements from settlements, natural reserves, industry, and zoning.

Spatial planning policies and strategies for wind farm development are worked out at the state level, and provide the basis for implementation at the municipal level. Developers then have clear expectations of potential sites, making the process much more efficient. As Maislinger of Energiewerkstatt Consulting GmbH contends, Burgenland zoning has been so carefully created that project development primarily occurs across multiple suitability zones:

> Most often it is piece-by-piece. In a few cases, you also have a huge zoning area. I don't think I've see such a zoning area for more than five turbines.

Once an available suitability zone has been identified by developers, the municipality in which it is located must file an application with the regional government for the permitted use of this land. A brief period of public input occurs followed by an event in which the regional government permits zoning for wind farms, housing, and other sectors. This event happens four times a year. The zoning procedure may take 3 – 6 months, and is followed by the Environmental Impact Assessment phase. Pitzer of the Püspök Group continues with an overview of this next stage in the development process:

> The Environmental Impact Assessment itself takes around 1 year to prepare everything [and] have it sorted out by all the experts, if the documentation is complete…If you have any claims from the public or NGOs, which can also make a claim within the Environmental Impact Assessment, then there has to be a public negotiation.

Burgenland's Environmental Impact Assessment requires wind farm development to consider an area's spatial features via fifteen certificates. Environmental Impact Assessment criteria is outlined in Appendix H. The state's Environmental Impact Assessment supplements the policies previously identified and pertains to the broader definition of sustainability identified in the methodology. Requests for Environmental Impact Assessment are reviewed and certified by experts within the regional government. When there is a problem with any one of these topics, developers are not allowed to proceed unless the issue can be rectified. All certificates must be fulfilled in order to establish a wind farm. Schubaschitz and Haider of Energie Burgenland Windkraft GmbH review one example:

> Shadow impact is very important for the inhabitants of the villages because they fear they will sit in their garden and be in the shadow of the blade. That never happens because of the distances we have to keep.

Burgenland's zoning strategies and Environmental Impact Assessment pose serious challenges for wind farm development but their application works to maintain a high level of sustainability. Maislinger of Energiewerkstatt Consulting GmbH identifies some of these spatial challenges:

> You need a lot space because you have to keep certain distances to houses, to villages, and so on. You have to keep certain distances to some infrastructure facilities like highways, overhead power lines, and so on. You look at if there are some [environmental] protected areas...You also have to look at how you can transport the turbine parts to the site, because in some areas this can be difficult."

As conditions in the area change, as identified in the previous section on environmental sustainability measures, the policies and processes of spatial planning in Burgenland are likely to change as well. The extent to which this may shift in Burgenland is described by Marimger of IG Windkraft (Austrian Wind Energy Association):

> Now the zones are…nearly filled…They are discussing about increasing the zones or if the zones are still adequate. The conditions for the zoning are still varied. For example, they conducted a study regarding…the influence of wind turbines on birds in Burgenland. The outcome was that the effect…was much lower than they expected… That might lead to other zones or a different zone design. If there are new zones, I think there will be more development.

As the likelihood of turbine repowering increases, so too does the need for zoning changes. Stanzer of the Austrian Institute for Regional Studies and Spatial Planning explains the possibility:

> The zone changes in two ways. The distances to the settlements get bigger and the maximum height of the power plants change…We look at the difference between the house and wind power plant. We have a GIS model of the terrain…From this point, how much of the wind power plant you can see? How big is the field of view? This helps us to have a look at the different effect of wind power at different heights and different distances in regard to terrain.

Inherently within spatial planning for wind farm development, there are environmental critiques.

Schellmann of the WWF Austria states:

> There are still some areas of Austria where you have bigger landscapes without roads or without bigger infrastructure in between. For the long-term, we also would like to have these landscapes under some kind of protection. Some are already national parks or similar things, but they are still very unprotected and that's why we would like to have them out of any sort of infrastructure development. Around this, we also apply…a 5km buffer zone. This was one of the points that was not going into the [spatial planning] legislation…The 5 km buffer zone is on our wish list.

Burgenland's spatial planning policies and strategies are imperfect but have largely been accepted by stakeholders. One potential answer for future zoning challenges may be to move beyond regional capacities in order to support more coherent national spatial planning of renewable energy sources and associated electrical grid infrastructure. Stix of the federal Austrian Conference on Spatial Planning (ÖROK) elaborates:

> You have to take into account the [bureaucratic] competences… There are competences at [the] national and regional level. We do not have a politically approved national [spatial] framework for renewable energy supply, where it says, for example, 'Austria wants to use a lot of renewable energy. There are the zones where this or that would be fine to use because you have water, you have wind, you have sun.'…I think it should be worked [out] by the Federal Ministry of Science, Research, and Economy because they are responsible for energy.

The mutual decision making approach in the origins of Burgenland spatial policy has to lead to comprehensive and specific requirements for designated wind turbine suitability zones. As the situation changes, the zoning framework is tasked with staying current and meaningful. The engagement and acceptance of stakeholders is critical to implementation, and is detailed in the next section.

For more information on Burgenland's spatial planning methods, see sections 2.4 and 3.4 of the 2014 WWF report "Burgenland – A Best Practice Example for Sustainable Development of Wind Power?"[10]

Stakeholder Engagement and Acceptance

Since the initial stages of wind farm development in Burgenland, planning has been an inclusive and collaborative effort. The qualitative data reflects a high level of communication and coordination among the different stakeholders, resulting in clear electrical grid infrastructure requirements, strong environmental sustainability measures, and mutually respected spatial planning methods. Formal and informal communicative planning efforts inform stakeholder engagement and acceptance throughout wind farm development. Interviewee dialogue reflects on these processes.

Scherhaufer coordinates the TransWind Research Project in the Institute of Forest, Environmental, and Natural Resource Policy at the University of Natural Resources and Life Sciences Vienna (BOKU). The TransWind Research Project examines how various wind energy expansion scenarios and factors are assessed by affected groups. The initiative serves as an example of informal stakeholder engagement. Scherhaufer reflects:

> We started with the triangle described in the literature by Ralf Wüstenhagen, a Swiss colleague. He tries to explain how wind energy could be socially accepted. Our starting point is that social acceptance is dependent on three determinants: the social-political acceptance, the local acceptance, and the economical acceptance. We tried to use this as a starting point and said, 'Maybe it is not enough to describe the specific Austrian situation. Maybe you have more variables or determinants that should describe the social acceptance of wind energy.'

The Wüstenhagen triangle of social acceptance was previously identified in this report's literature review in Figure 11. The TransWind Research Project uses a participatory approach and quantitative models to understand siting influences, examine case studies, create development scenarios, and make recommendations that support wind energy acceptance. Case studies, wind farm visualization, and focus groups are used by the TransWind Research Project. Scherhaufer continues:

> What is difficult in our project is that we try to integrate as many stakeholders as possible…formed in a so-called 'reference group' from the beginning. We ask…'Who could be an interested stakeholder in our project?' We asked about 60 – 70 people and we just numbered their response. The organizations or institutions who got the most numbers, we invited into our project…We say how they could influence our research.

The list of the selected TransWind Research Project stakeholders is identified in Appendix I. As stakeholder perspectives are incorporated into the research, the TransWind Research Project hopes that results lead to better wind farm planning, greater involvement with local communities, and consideration of whether or not it is appropriate to develop. Examples of influential factors cited by stakeholders include climate change, CO_2 reduction, environmental and biodiversity, and landscape impact. Johannes Schmidt, also of the TransWind Research Project, reflects on one stakeholder's concern:

> APG always stressed that our modeling approach is not sufficient to assess the technological feasibility of the different possible spatial configurations of wind energy because the transmission grid is not considered in the modeling process.

Overall, the electrical grid was not a major concern in the TransWind Research Project stakeholder process. However, the limitation of the quantitative model demonstrates the inherent complexity of integrating multiple perspectives into stakeholder knowledge of wind farm development. The challenge of balancing stakeholder objectives between and within organizations is widespread in wind farm development. Wichmann recalls the difficult task of considering competing environmental and renewable energy objectives of BirdLife Austria:

> On one side, we are a NGO and trying to stop some of the major projects that are harming the environment of birds. On the other perspective, we try to find solutions and make zoning studies…We are a little bit of a mixed position. In the environmental assessments, we were advocates for the wind power plant companies. On the other side, we were trying to find solutions with the companies as well as with the inhabitants, because they get a lot of money for small villages…NGO is a major role for us but we are trying to find some compromises…Most people [in BirdLife] don't want wind power plants because they can kill birds, change the distribution of birds…But, I think that other alternative energy, like biomass and so, are affecting the birds more than wind power plants. That is why it is very hard for our organization.

Wichmann points out that a major source of contention for contested sites stems from the different timeframe of stakeholders. Whereas a developer may only be looking at several years

for their break-even point, BirdLife Austria is concerned with a longer timeframe as well as objectives that are more difficult to quantify. Furthermore, with the national subsides scheduled to close at the end of 2015, there is added incentive to push development through. Competing perspectives underscore why it is important for there to be formal and informal processes that promote stakeholder engagement and acceptance.

In addition the formal processes set forth by Burgenland's spatial planning requirements and the informal TransWind Research Project, stakeholder collaboration is prevalent. Engagement remains highly intentional and often leads to higher levels of acceptance. Marimger of IG Windkraft (Austrian Wind Energy Association) states:

> We are accustomed to working with different stakeholders because it is a part of the development of wind energy in Austria. We always have lots of discussions with everybody about it because it is a landmark. TransWind is just another part of those discussions.

Each interviewed stakeholder recalled the high level of stakeholder engagement within Burgenland and in some parts of Austria. Maislinger of Energiewerkstatt Consulting GmbH agrees:

> Most of the developers make public consultation a part of the work. They [the public] have read about noise, infrared noise, shadows, and so on. There are so many questions and most often it is better to answer these questions before they get worse and they say 'no.'

Wind energy benefits from a high level of support throughout Austria. Marimger of IG Windkraft (Austrian Wind Energy Association) states:

> It's always difficult to say how to people will react to more [suitability] zones and more wind power. Usually in Austria, people are very pro-wind energy. We had some surveys in the past saying between 80 - 90% of the people are pro-wind energy. It's one of the most favorite forms of energy production [in Austria]."

In 2013, an opinion poll conducted in Austria by IG Windkraft found that 77% of Austrians are in favor of wind energy.[72] Of those currently living near a wind farm, the poll found that 82% said the turbines have no impact on their life, 15% said the turbines have a positive impact, and 4% said the impact was negative. Notwithstanding this level of stakeholder acceptance, the public's involvement primarily occurs through local government representation and by way of private contract negotiation with developers. Stanzer of the private Austrian Institute for Regional Studies and Spatial Planning recalls a recent instance of working with developers and the Burgenland government for wind farm repowering:

> I just had some calls with Bürgermeister [mayors]…concerned with the repowering. On Friday [December 12, 2015], I am in Burgenland to tell the mayors what can change in their communities. Just one week ago [December 3], we talked with the wind power companies…It's a big discussion. So there is a discussion with the companies, a discussion with the communities of the mayors…We say the public is represented by the mayors… That's one thing you have to keep in mind to have a better understanding of what's going on in Burgenland. There is quite a high discussion culture.

Stanzer identifies the extensive role that discussion has in stakeholder engagement, but goes on to state that the period of public input only occurs after zoning and before the completion of

permitting. Government serves to represent the public in all decision making affairs.

Regarding land contracts, the affected property owner is dealt with privately. Pitzer of the Püspök Group outlines their interaction with public:

> If you do it in a group, there are advantages and disadvantages…If you go to a region where nobody has any experience with wind farms, then it might be more helpful to have a meeting with the entire group of landowners and tell them what you want to do. Present them the contacts and then have them sign the contracts directly at the meeting. However, as soon as people know how things work, it is better to address everyone individually…There is no standard recipe for communication. You have to adjust to wherever you are…Of course, afterwards, as soon as you have the wind farm in operation, people are invited to see it and feel it and to not be scared of it…You have to take away those worries."

Sustained and focused efforts such as these help developers understand the public's perspective, and thereby reinforce the likelihood of acceptance. Moreover, there is strong financial incentive for property owners to agree to wind turbine contracts. As previously identified in the financial feasibility section by Schubaschitz and Haider of Energie Burgenland Windkraft GmbH, property owners can receive substantial compensation annually for the use of their property Pitzer identifies the parameters within Püspök Group contracts:

> There is one contract covering the construction of the turbines, the plots themselves, the areas before the turbines, the cables, the right to use the land with lorries or trucks. Everything has to be covered within this one contract… I think we always find consensus with the stakeholders to complete our project.

Pitzer also identifies the necessary contracts with the municipality for using public roads for the wiring that connects the utility substation with the wind farm.

Goby of the Umweltdachverband addresses the sensitivity that is required by developers when working with the public and the government by extension:

> It affords a certain change of mind, which is slowly coming up but is taking very long to get it in the heads of people. We have it when it comes to urban planning and rural development matters. There, we have the plans and…we have the [suitability] zones…When it comes to renewable energy infrastructure, we don't have it yet.

As addressed in the other thematic sections, the Regional Policy Framework for Wind Turbines and the Burgenland 2020 Regional Development Strategy are active formal guidelines that support stakeholder engagement and acceptance. In any area of the federal state where wind energy is pursued, the involvement of the public and NGOs is always a central concern by developers and the municipality. Although perspectives may vary within and across stakeholder groups, formal and informal engagement and acceptance efforts are highly valued and generally lead to better results for those involved. Burgenland's integration and coordination of diverse stakeholders is evident within the state's political commitments to wind energy.

For more information on stakeholder engagement and acceptance, see sections 3.2, 3.3, 3.4, 4.2, 4.3, 4.6, 4.7, and 4.8 of the 2014 WWF report "Burgenland – A Best Practice Example for Sustainable Development of Wind Power?"[10]

Political Commitment

Each interview was quick to point out that Burgenland's success is largely the result of strong and clear political commitments to wind energy. This is a defining theme and has largely influenced the wind farm development possibilities found in the other identified themes. The efforts of the Burgenland government, especially from Governor Hans Niessl, have signaled to all relevant stakeholders that the federal state wants extensive and sustainable investments in wind farm development. As previously identified, the federal state's objective of 100% electricity from renewable energy sources was a highly motivating factor.

Schuh of APG confirms the government's strong motivations:

> Wind electricity is something like a project of honor for Burgenland. And it was well prepared by the local government because [of] their regional development plan.

Wichmann reflects on the goals of Governor Niessl and the involvement of BirdLife Austria:

> It was clear that they [the federal state] would involve us. We met Niessl and it was clear that we were working under this [regional] framework. It was clear that if we just get this result of the [bird] study together with landscape and so on, then they will accept it.

Stanzer of the Austrian Institute for Regional Studies and Spatial Planning emphasizes the distinct role that Governor Niessl has in spatial planning.

> The special thing in Burgenland is that the Landeshauptmann [Governor], he is the political representative for spatial planning. Really, the most important political person is the person most responsible for spatial planning. These agencies are always guided by the political representative. In this case, it's the Landeshauptmann.

The implications of strong political will are the primary difference between wind farm development in Burgenland and other federal states, especially Lower Austria. Lower Austria has the greatest total output (MW) of wind turbines in Austria, but development has been slow and inconsistent in recent years due to the lack of political commitment. Pitzer of the Püspök Group highlights this contrast:

> In Burgenland, you have the federal governor [Hans Niessl] who is interested in this topic. It is his topic. He is the leader of this topic. In Lower Austria, the federal governor is not interested in it…It is not his topic…Political support is very important. If you only send your assistant there, it is not the same as going there yourself as the head of the federal state…It's different in Burgenland than other federal states where you have the head of the federal government who is the leading guy for this issue. He is saying, 'I want to be energy independent from the outside.' Even though that is not correct…You have to send the energy around and to foreign countries so it's not correct. But at least it is a kind of message. It's a message to the people. It's a message to us…Due to this support by the head of the federal government, the people below him working in the government and responsible for evaluating and assessing the project, responsible for permitting the project…have a high motivation. When their boss says, 'This is great. Let's do it,' they also follow this motivation…What we experienced in the past in our federal state is that permitting time has reduced from, let's say, five years in the past to maybe a little more than one year.

Inherent in strong political commitment is clear messaging to stakeholders and government

partners. Pitzer further explains that the objectives of Governor Niessl have spread to workers in the regional government and the local government. For example, developers must gain the mayor's approval in order to proceed in the municipality's suitability zone application. Schellmann of the WWF Austria also identifies the noticeable differences in political commitments to wind energy by Burgenland and Lower Austria:

> The politicians of Burgenland have been clever enough to use…a lot of the EU [accession] money for the development of the zoning process, infrastructure, and also started two technical schools in this field. They really did quite a lot around the whole topic of renewable energy. That's why it was developing so well there. They also included NGOs and the public from the beginning so they have very little conflict in Burgenland…In Lower Austria, the politicians were a bit cowardly, they didn't want to take up this topic and they just left it to the municipalities to decide whatever they want…For more than ten years, the government of Lower Austria really kept out of this topic. There was a lot of uncoordinated development and the people were very scared because they didn't know what was coming up. There was no clear plan. There was no clear communication. And now in Lower Austria, you have initiatives against many wind parks, which is almost not happening in Burgenland.

As alluded to by Schellmann, political commitment by Governor Niessl and governmental partners is partly underscored by the public's push for clean energy, environmental sustainability, and involvement in the planning and development process. The public's role in regional and local government is identified by Pitzer:

> The support is there from the political side and also the support from the people. They see it as something positive. They think Fukushima…They remember and argue that it is better to have wind turbines than nuclear power plants, or fossil fuel plants, or thermal plants. That is the advantage that we have in our region. We have both support from the political side and the population. This is very positive.

Pitzer addresses the delicate political situation of wind farm development:

> We of course try not to break this positive atmosphere…This is reduced by people within the regional government, the people that are responsible for environmental issues. Of course, they step on the brakes and say, 'Yes, I like wind turbines but we have to slow down a little bit. We have to make less here and there to not infuriate the people.'

Scherhaufer of the TransWind Research Project responds similarly towards the changing political situation:

> This strong political leadership was very helpful to discuss major conservation aspects, to discuss the influence on the landscape, the influence on the people, noise…There is also a lot of trust, especially in Burgenland, about the party leader and the Landeshauptmann [Governor]…The situation now, maybe, is a bit more critical. Some people in Burgenland say, 'We achieved all of our goals. Now, stop it because it is getting too much.'

The Burgenland government's strong leadership in establishing explicit renewable energy development objectives has led to high levels of locally produced electricity from wind farms, although the electricity is transmitted elsewhere on the regional and national electrical grids. Schubaschitz and Haider of Energie Burgenland Windkraft GmbH reflect on Burgenland's political efforts for the future repowering of wind turbines:

> In Burgenland, we have a restriction on height. They say for some suitable zones, it is about 140 m height.

> That is not much. Because in a bad wind situation, all you need is the height. When you have 200 – 220m height, it is much easier to establish a wind farm because you can have a bad wind situation but it all comes with the height…We have to go to the government and say, 'Please make it higher.'…It is a running process because the government works on it all the time with us…You cannot say the government is 'sleeping' or something like that. In Burgenland, they really do something for the improvement.

Burgenland's clear political commitments locally and regionally contrast at times to international and national policy. Marimger of IG Windkraft (Austrian Wind Energy Association) reflects on the future of the Green Electricity Act support scheme and the influence of the EU:

> The main issue is how the support mechanism will develop because there are some trickle-down effects from the European level…In Austria, if there is a new support mechanism, it has to be developed with this view on the [EU] state aid guidelines…That's a big issue because the state aid guidelines are not really based on evidence. They are more based on pressure groups…At the moment, we [IG Windkraft] are not very okay with that…It's always some kind of insecurity in the system…It makes the whole system more expensive and more difficult. It's not the best for stable development of technology and energy production…if there isn't a stable framework for the future.

Such discrepancies across different political systems can lead to instabilities in the transition to renewable energy, as the development process is slowed and costs increase. Burgenland's stable framework may be negatively affected by EU and Austrian policies, despite historically effective local practices.

Burgenland's political commitments work both ways. Recently, wind development in Burgenland has been intentionally reduced by the government for fear of encroachment on environmental and public spaces. Schellmann of the WWF Austria explains:

> There were demands from some municipalities to get some more space for wind turbines because they have good wind conditions and it is quite a good income for municipalities…That is where we got a bit more involved in the discussion. We used the contacts we have in Burgenland to tell our opinion, and there was a consultation process where we have been involved. In the end…the head of the Burgenland government [Hans] Niessl was there and did a press conference together…He said, 'The big development of wind power is done.' He is not willing to designate much more space for windmills than they have already. So he was really, very much sticking to the plans.

Because of strong political commitments by the regional and local government, especially Governor Niessl, Burgenland has had tremendous wind farm development for over a decade. Now, as the federal state becomes saturated with wind turbines, the government is attempting to curtail its development in order to balance its sustainability objectives. In the future, the government remains open to repowering turbines. The inherent limitations of wind farm development are recognized and respected by private developers. Maislinger of Energiewerkstatt Consulting GmbH reflects:

> Most of the places where we have good wind conditions, good ecological conditions, and where the mayor wants a wind farm there, those places are very rare now…The few the places that look good, there are many developers trying to get the contracts on these places now. In my opinion, in Lower Austria and in Burgenland, all the places are more or less fixed.

With wind farm development nearly complete in Burgenland, private groups are transitioning into the profit-making operations phase. In light of the feed-in tariff ending in 2015, developers

are rush to finalize permitting, commissioning, and construction. The focus then is shifted to stabilizing the business, maximizing kWh, and minimizing turbine standstill, throughout the duration of the land contracts. Private developers, NGOs, and the regional government are largely in agreement on the future of wind farm development in Burgenland and the limits of growth. This is a reflection of strong political commitment, as well as ongoing stakeholder engagement, environmental sustainability measures, and spatial planning methods, and financial feasibility.

For more information on Burgenland's political commitment, see sections 3.4 and 4.1 of the 2014 WWF report "Burgenland – A Best Practice Example for Sustainable Development of Wind Power?"[10]

GIS Spatial Analysis

The spatial considerations of wind farm development in Burgenland have been identified through a multi-level policy study and thematic analysis of stakeholder interview data. To support these findings, the report uses GIS for visualization and further analysis. Wind farm data has been provided by Energie Burgenland Windkraft GmbH, a stakeholder interviewee and the largest wind energy producer in Burgenland. The location of Energie Burgenland Windkraft GmbH's 214 wind turbines are displayed against Burgenland's wind resource potential, elevation, land use considerations, and land use considerations with EU NATURA 2000 protected sites. The final two spatial analysis applications are directly informed by the stakeholder interviews. North Burgenland is viewed using the state-required municipality buffers and turbine locations. The final map displays recommended electrical grid connection distances and turbine locations. Burgenland's wind farm suitability zones were not available, despite several requests. Stanzer of the Austrian Institute for Regional Studies and Spatial Planning, one of the suitability zones creators, recently asked but was denied as well. Nevertheless, the accompanying maps demonstrate an important spatial perspective of a local developer's approach.

Wind Resource Potential

As noted earlier, compared to the other Federal States, Burgenland has a high level of wind resource potential. This is especially true for Northern Burgenland, where Energie Burgenland Windkraft GmbH has developed the bulk of their turbines. Their Andau wind farm in north Burgenland has 79 turbines with a total output of 237 MW. As of 2014, this is the third biggest onshore wind farm in Europe and the largest in Austria based on installed capacity.[73] Their two Enercon 126 turbines in Potzneusiedl are among the largest and most powerful models in the world, each with a nominal power rating of 7.5 MW, a hub height of 135m, and a rotor diameter of 127m.[73] Because of Burgenland's advantageous wind resource potential, they are used for testing wind conditions similar to the North Sea. Figure 17 displays the 2009 – 2011 wind resource potential of Burgenland at 100m above ground level, using a 100m x 100m resolution.[74]

Elevation

The advantageous wind resource potential of Burgenland is largely made possible by an open landscape with low elevation and little slope. For wind farms to take advantage of high wind

resources, they must be developed in areas where the project it technically and financially feasible. Higher altitudes entail greater wind resource potential, but it is challenging to pursue development there because of technical, logistical, and financial reasons. Grid access, road access, and icing on turbines are major concerns at higher elevations. Eastern Austria has low elevation and little variation in slope, and is therefore ideal for large-scale wind farm development. Figure 18 displays the elevation of Burgenland, using a 90m Digital Elevation Model, and the location of Energie Burgenland Windkraft GmbH turbines.[75]

Land Use Considerations

As demonstrated within Figure 19, there are several land cover and land use variables that wind farm development must consider. This is necessary to meet the mandated sustainability parameters identified in local, national, and EU policies. As a result, the wind turbines of Energie Burgenland Windkraft GmbH are primarily clustered in the north and northeast of Burgenland. The turbines are sited in non-irrigated arable land and away from areas important to habitat and bird protection. Additionally, the wind turbines are located a sufficient distance away from municipalities and residential areas. The wind turbines are located within sufficient distance of APG's 380 kV and 220 kV transmission lines, thereby limiting the construction costs of new underground connection wires. Land in Burgenland needs to be planned and monitored appropriately to serve its different purposes and multiple stakeholders. As previously identified, Burgenland's primary industries are wind energy, ecotourism, and agriculture. Their success is interconnected and must be considered from a comprehensive and geographical perspective, as addressed in this report through various policies and stakeholders interviews. Figure 19 displays classifications according to EU Corine Land Cover 2006, various land use variables, and wind turbine locations.[76]

Land Use Considerations with EU Natura 2000 Sites

The land use considerations of Energie Burgenland Windkraft GmbH are explored with the addition of EU Natura 2000 sites, as displayed in Figure 20. The EU's Birds and Habitats Directive and nature conservation measures are integrated into the protected Natura 2000 sites. The area surrounding Lake Neusiedler is also under protection by UNESCO because of its World Heritage status for its cultural landscape contribution. As previously identified, strong environmental policies from multiple levels of government have greatly influenced wind farm siting and decision making processes. There is unprotected forest in Burgenland's central and southern areas, but the Burgenland Environmental Impact Assessment likely prevents any wind farm development at these locations. Additionally, there is ongoing Natura 2000 renomination process for at-risk sites, spearheaded by environmental advocacy organizations such as Umweltdachverband. Figure 20 geographically displays Burgenland's protected Natura 2000 sites in addition to the area's EU Corine Land Cover 2006, land use variables, and Energie Burgenland Windkraft GmbH turbine locations.[77]

North Burgenland – Required Distance from Municipalities

Figure 21 displays the geographic proximity in northern Burgenland using the state-required 1000m minimum buffer between municipalities and wind turbines. The figure was determined

through policy studies and stakeholder interviews. Stanzer of the Austrian Institute for Regional Studies and Spatial Planning reflects:

> In 2002, we had been the first [organization] in Austria who were looking for buffer zones across settlements. Buffer zones of 1000m [between a village and a turbine], which was at this time was quite a big zone…These areas should be reserved for windkraft [turbines].

One reason why this buffer distance has worked well is because of the urban development pattern of Burgenland. Few individual residences exist separated from the municipalities, leading to continuous development. Scherhaufer of the TransWind Research Project states:

> I would say they have special circumstances which allow them to become a success story. One is the spatial distribution or the coherence of the villages…The spatial distribution of the villages is very coherent. You have a town or a village, and there are not so many buildings or small farms outside. In other Bundesländer [Federal States] in Austria, it's much more different.

For the intents of statewide wind farm development research, using municipality data is preferable. This is partly because of Burgenland's urban development spatial coherence, low population (the capitol Eisenstadt is the largest municipality with 13,485 persons), and agriculture land use. Other research, especially collaborative work with local residents, should attempt to use parcel data as well as municipality data. Figure 21 demonstrates the geographic and policy constraints of wind farm development on settlement areas.[78]

North Burgenland – Recommended Proximity to the APG Electrical Grid

The final map is based on information received through resources provided by APG and stakeholder interviews. The exact location of electrical grid substations and transmission lines is not publicly available due to security reasons. Therefore, approximate spatial data was found using a publicly available map of the APG 380 kV network. Using the ArcGIS editor tool, the transmission lines and substations were georeferenced from the APG network map and overlaid with a map of Burgenland set at the same scale and projection. Although the spatial data of APG substations and transmission lines is not perfect, it is a sound first-order approximation of data that is otherwise inaccessible. Stakeholder interviews contributed to the spatial analysis by addressing the geographical needs of interconnection between wind turbines and the electrical grid.

Maislinger of Energiewerkstatt Consulting GmbH states:

> If it is just agricultural land, it would be easy and cheap to dig the cables into the ground. If there are a lot of villages, or we have to cross a river, or roads, or railways, and so on, that makes it much more expensive…Very often in Austria, we have distances of 5 – 15 km. This is most often not a problem, even for smaller projects with 10 MW or so.

Similarly, Pitzer of the Püspök Group states:

> The usual way of siting is as close as possible to the grid access, definitely. You want to be below between 5 – 10 km of cable, or 1 km in best case but it is never possible.

It is assumed that Energie Burgenland Windkraft GmbH uses similar spatial parameters as the other developers in the area. As displayed in Figure 22, the 220 kV and 380 kV transmission lines are buffered at 5m, 10m, and 15m to reflect the recommended proximity from Energie Burgenland Windkraft GmbH wind turbines to the APG electrical grid. The location of APG substations are included in the map as a point of reference. The substations are financed or co-financed by wind development firms, and therefore must be sited in close proximity to the wind turbines. The wind farm cluster in the north part of Figure 22 satisfies this requirement, but it is unclear how the wind farm in the south part of Figure 22 adequately utilizes the nearest substation. This is an inherent challenge of georeferencing and approximating publicly unavailable data. Nevertheless, Figure 22 successfully demonstrates the recommended proximity to the APG electrical grid.[79]

Figure 17

Wind Resource Potential

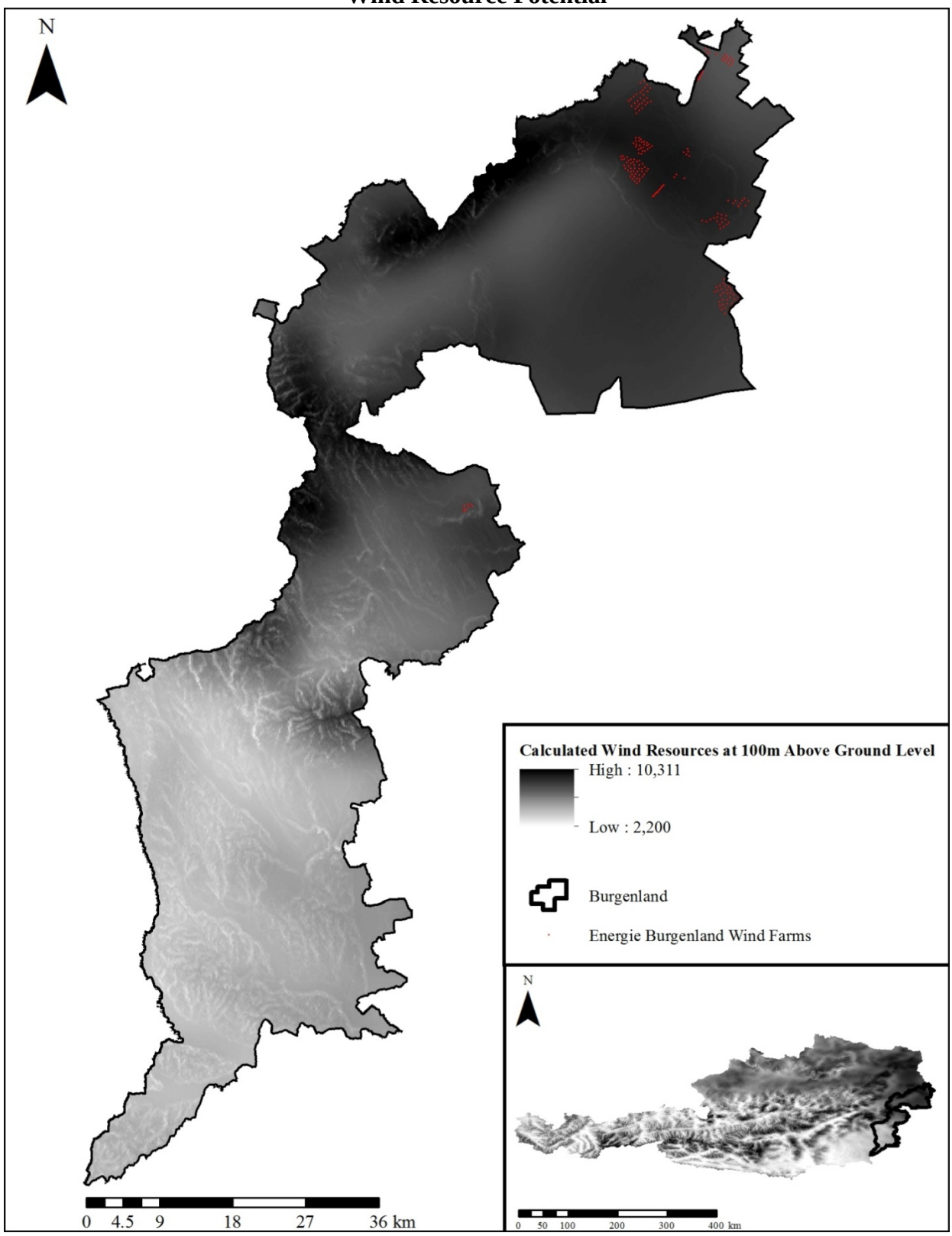


Figure 18

Elevation

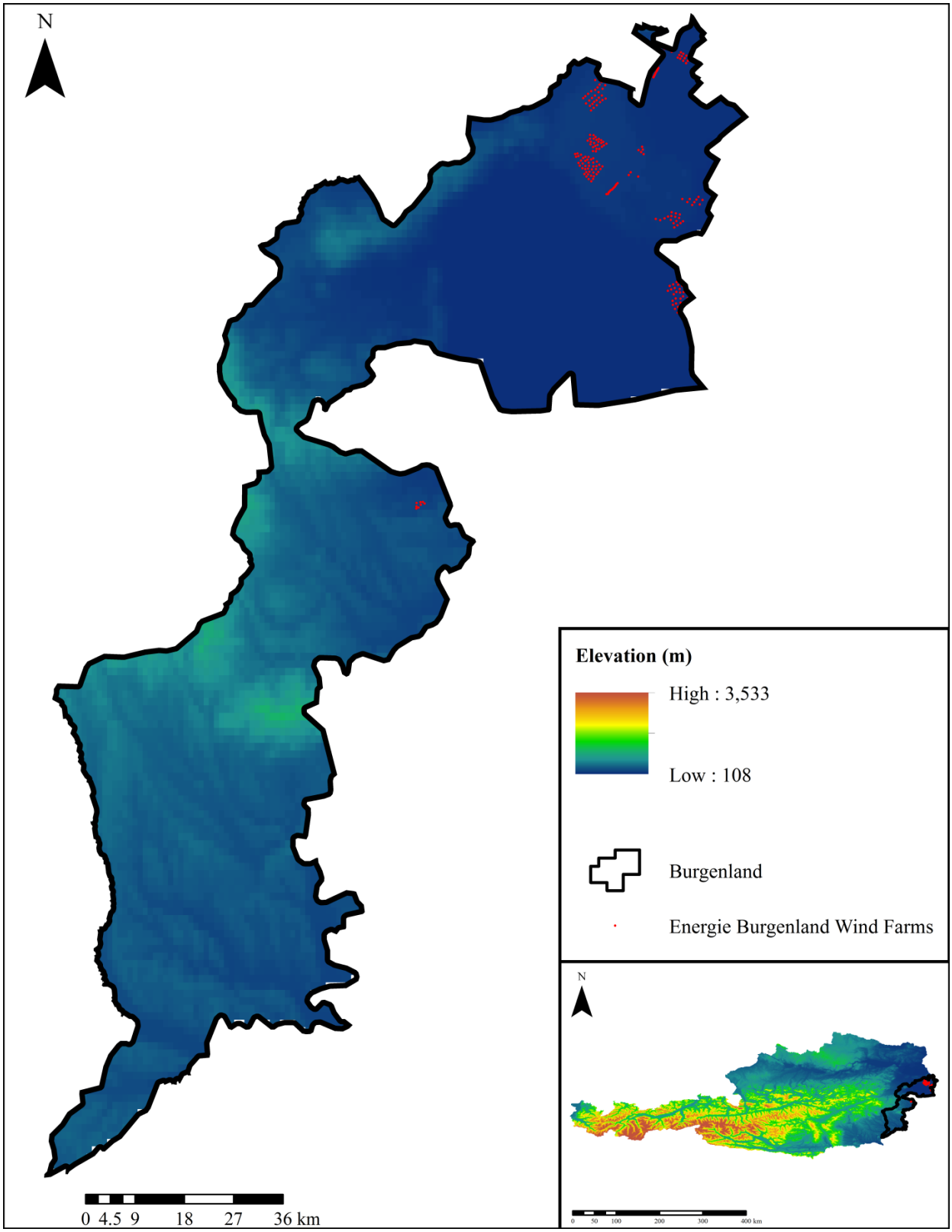


Figure 19

Land Use Considerations

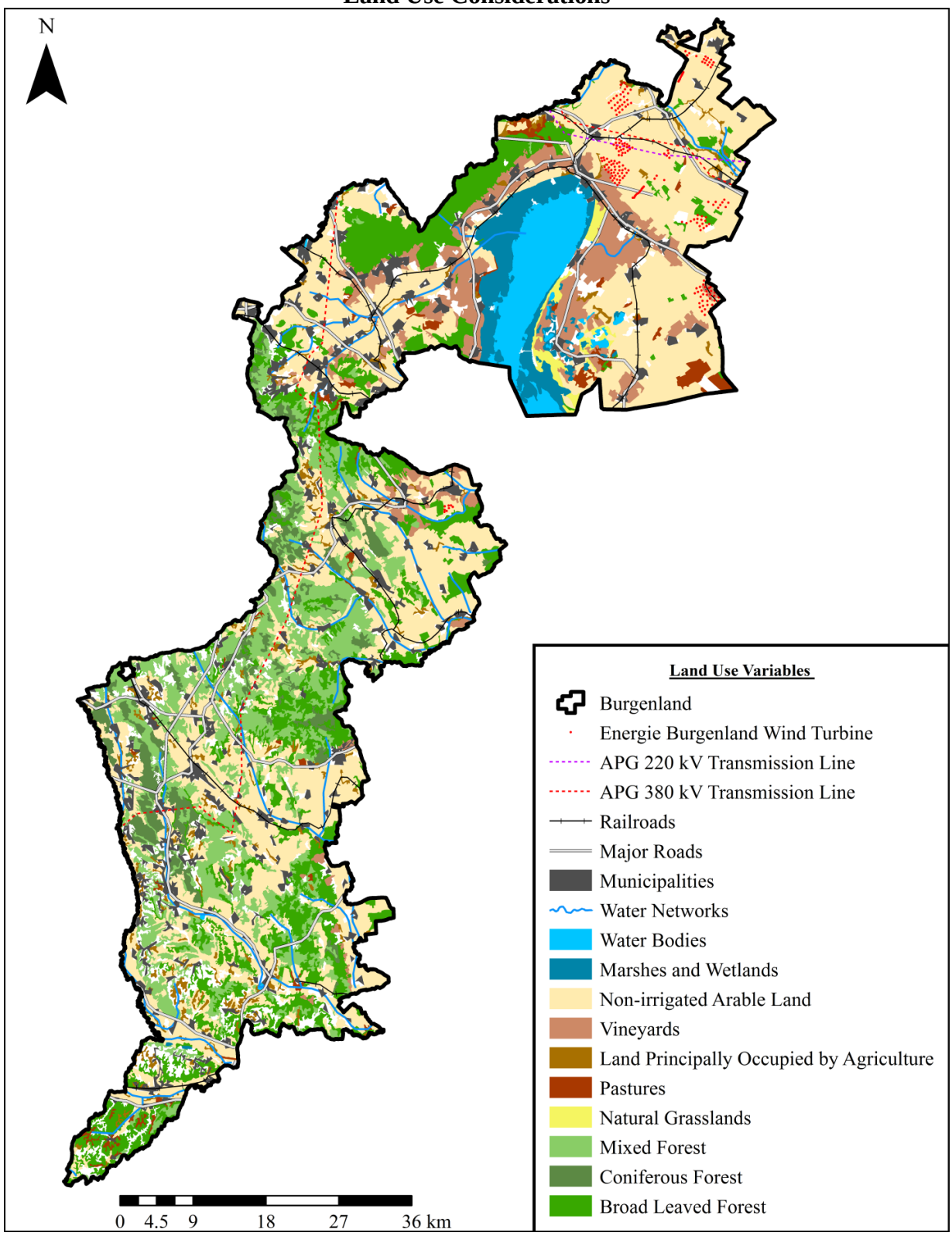


Figure 20

Land Use Considerations with EU Natura 2000 Sites

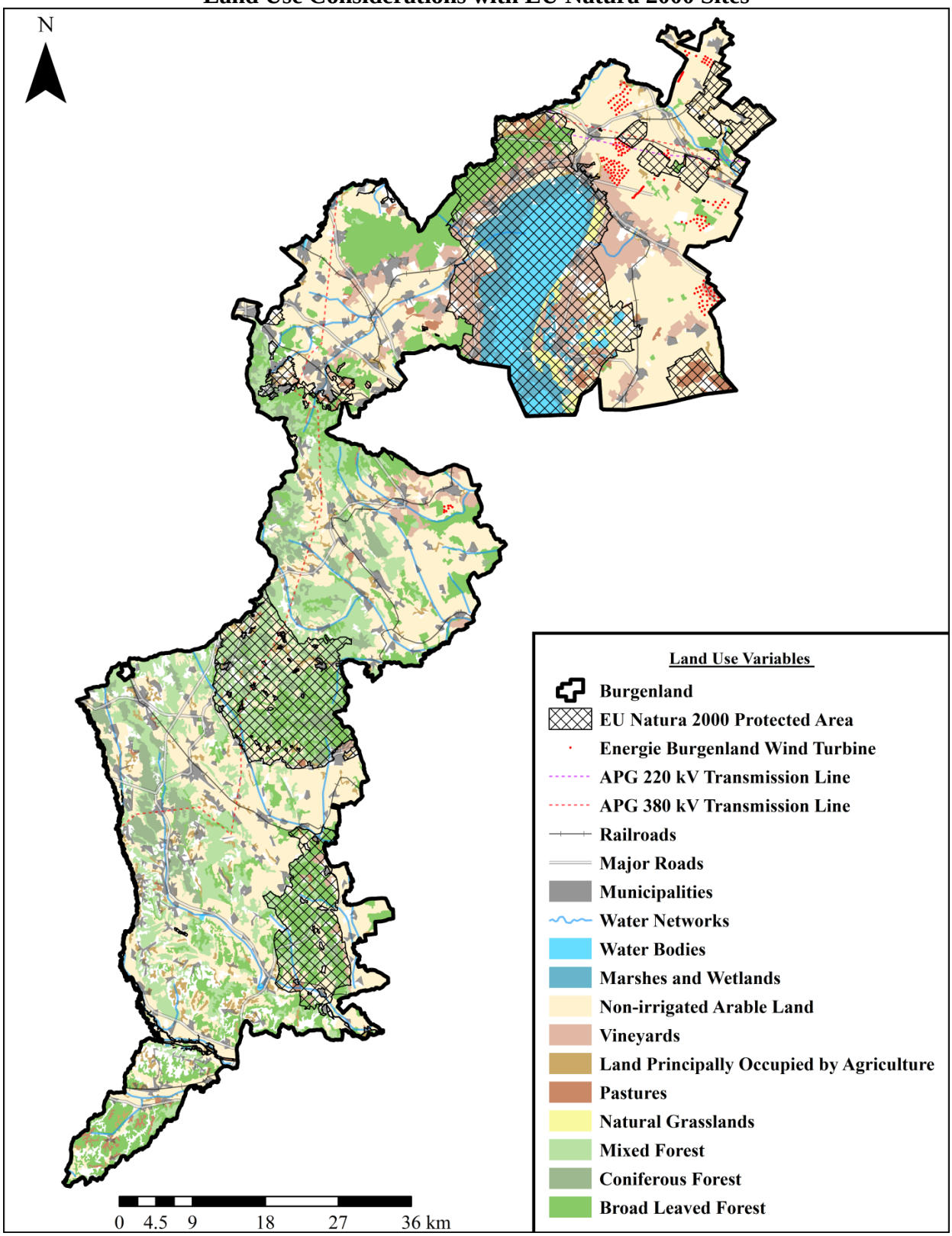


Figure 21

North Burgenland – Required Distance from Municipalities

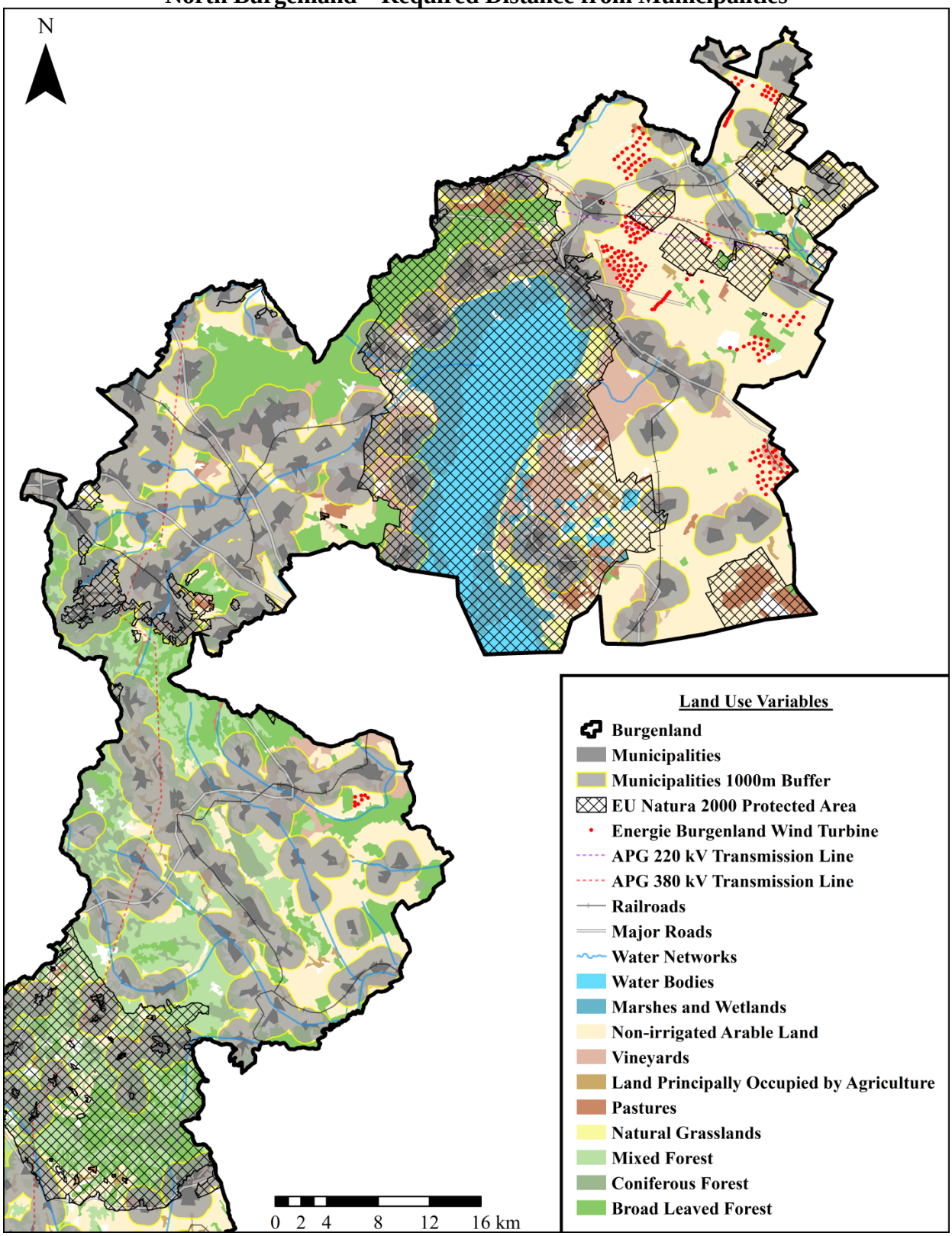
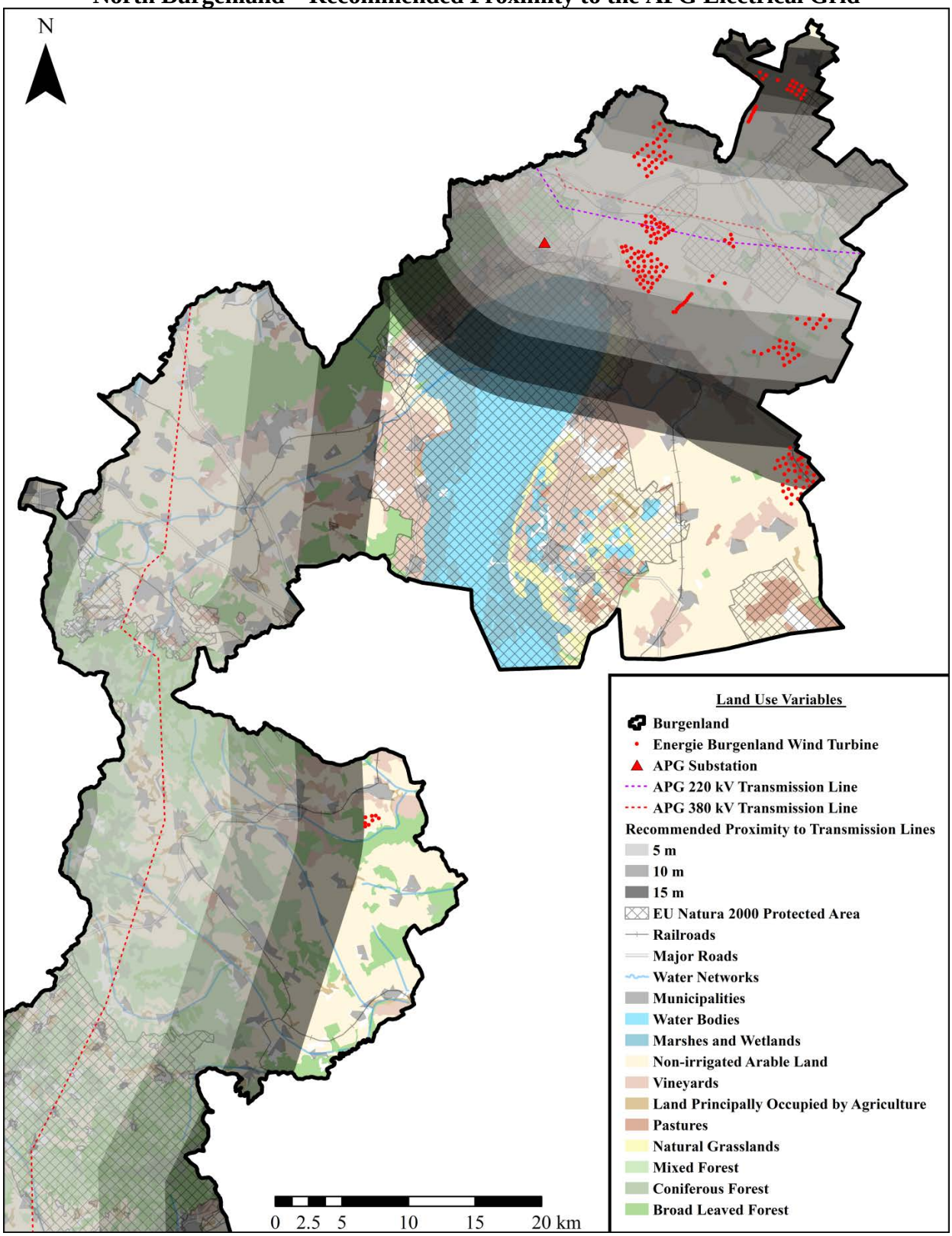


Figure 22

North Burgenland – Recommended Proximity to the APG Electrical Grid



GIS application is informed by the policies, spatial considerations, and decision-making processes identified throughout the report. Additionally, this task was structured through insights gained through stakeholder interviews. As an example of local-level application, Figures 17 – 22 demonstrate the development strategy of Energie Burgenland Windkraft GmbH. This is accomplished through the spatial representation of 214 wind turbines and various criteria, requirements, and recommendations. The GIS spatial analysis is a resource in understanding the sustainable siting of wind farms. Maps are useful for displaying boundaries, conditions, and trends. For the intents of this report, exploration at a regional scale is sufficient. Future GIS research may wish to apply smaller scale analysis based on the conditions immediately surrounding the development site. This may include variables such as noise emissions, visual impact such as the turbine viewshed, and other subjective aesthetic factors. Overall, this report benefits from a spatial perspective of the wind farm development issues and themes found within the multi-level policy study and the thematic analysis of stakeholder interviews.

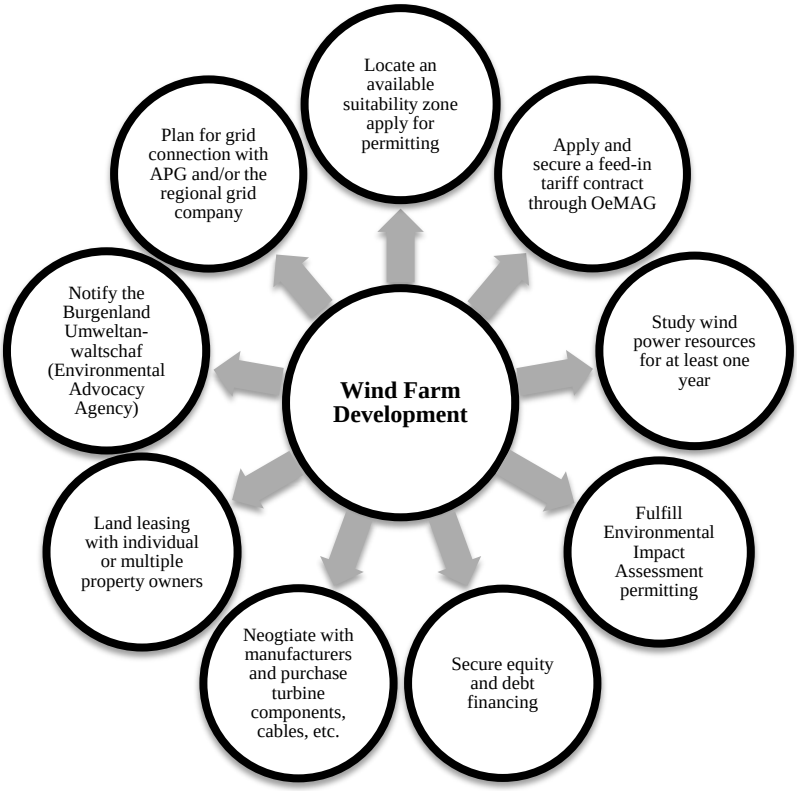
Discussion

This section provides research takeaways on the sustainability measures and best practices inherent in Burgenland's wind farm development. First, the general process of wind farm development in Burgenland is outlined. A SWOT analysis is then utilized to further evaluate the policies, decision making processes, and siting considerations in the development of wind farms and related electrical grid infrastructure in Burgenland. Lastly, the limitations of this research are addressed.

The Wind Farm Development Process

As displayed in Figure 23, the process of wind farm development is non-linear. Developers must consider a variety of influences and stakeholders all at one time. No development project is the same, but Figure 23 provides a general outline of what it generally looks within Burgenland. The identified factors are a direct result of the researched policies, decision making processes, and siting considerations.

Figure 23



SWOT Analysis

Based on the report's qualitative and quantitative research, the factors that have led to successful wind farm development in Burgenland are assessed using a SWOT Analysis. Collectively, these factors represent the common threads found within the multi-level policy study, thematic analysis of the stakeholder interview data, and GIS spatial analysis. See Figure 24 for the SWOT analysis.

Figure 24

Strengths	Weaknesses
• Stakeholder engagement and acceptance • Environmental sustainability measures • Spatial planning methods • Political commitment	• Public interaction
Opportunities	**Threats**
• Advantageous location	• Financial feasibility of development • Electrical grid infrastructure requirements

Stakeholder engagement and acceptance is a clear best practice example. The achievements in wind farm development are partially the result of a diverse group of stakeholders intentionally maintaining a strong dialogue from the very beginning and throughout the development process. The resulting wind energy policies and siting decisions are mutually beneficial through an inclusive manner in which stakeholders are able to advocate for their interests. All stakeholders were expected to work together to address central concerns, provide resources and knowledge, value multiple perspectives on the issue, and find consensus. The extent of stakeholder engagement and acceptance is connected to various environmental sustainability measures. Austrian environmental protection laws and EU policies such as the Bird Directive and Habitat Directive, Natura 2000 sites, and UNESCO designations generate impactful environmental policies related to wind farm development. Burgenland complements these policies by maintaining stringent environmental standards through the Regional Policy Framework for Wind Turbines and the Burgenland 2020 Regional Development Strategy. Stakeholder engagement and acceptance supports environmental sustainability measures through the creation of suitability zones. The spatial planning methods employed within Burgenland are strengths because they have granted certainty and stability to the development process, and therefore have positive financial implications. The comprehensive and specific requirements for designated wind turbine suitability zones remain dynamic and open to input by stakeholders as conditions change. This is the result of Burgenland's clear political commitment. From the beginning, Governor Niessl has been a strong influence in setting Burgenland's renewable energy and electricity self-sufficiency vision. His leadership has spread to other branches of the Federal State, resulting in effective development and spatial policies that have buy-in from multiple stakeholders. The political commitment of Burgenland and the TBL approach favored by Governor Niessl stands in contrast to other Austrian Federal States.

One area where wind farm development in Burgenland is weak and stands to improve is in public interaction. Whereas stakeholder engagement and acceptance efforts are strong, there exist few opportunities specifically for the public. The research found that public interaction

primarily occurs through brief private communication via land lease contracts or large public marketing campaigns. There is a limited role that the public has in reviewing the designated suitability zones or the Environmental Impact Assessment permitting. When these policies are open for public review, the time for public comment is brief. This perceived weakness may be the result of various forces. The public may place a high level of trust in elected officials and believe that their interests will be adequately represented. A similar attitude is believed to be held by the government towards the public, as documented within the interviews. This may be particularly true for the Umweltanwaltschaf, the Federal State's Environmental Advocacy Agency. Secondly, the affected public may be active elsewhere such as through non-governmental organizations like the WWF Austria. Public involvement may primarily occur through political advocacy or stakeholder membership, rather than through civic arenas such as the review period for Environmental Impact Assessment permitting. Lastly, the public may be content with wind energy and simply do not wish to involve themselves. Wind energy is viewed favorably throughout Austria. For the public in the vicinity of wind turbines, most likely farmers, wind farms provide an additional source of income. Depending on one's perspective, the role of the public in wind farm development may be viewed as weak because of reduced interaction outside of individual moments. At the very least, it is something to improve upon.

The opportunities that exist for wind farm development in Burgenland manifest in the advantageous location, electrical grid infrastructure requirements, and political commitment. Burgenland is an ideal location for wind farms and over time wind farm developers have exploited this. Now, the Federal State is at the point where parts are saturated with wind turbines and developing more will negatively affect sustainability. Through updated suitability zones and new turbine technology, wind farms repower in the same location and take advantage of the same high quality resources. Alternatively or in addition to repowering, wind farm development can take place in the south where wind energy has been less explored because of lower wind resource potential. Should suitability zones be updated and the correct turbine technology is available, these areas may be carefully explored for continued development.

Threats to wind farm development primarily result from the associated challenges surrounding financial feasibility and electrical grid infrastructure requirements. Since the Green Electricity Act was implemented in 2011, wind farm development has progressed with structured annual feed-in tariffs for new energy sources. At the end of 2015, this subsidy will cease to exist because certain technologies have matured and development costs have lowered. In the future, there will be no preferred intake of renewable energy or the guaranteed purchasing of electricity above market rate. Therefore, clean energy developers will have to leverage greater amounts of equity and debt financing to make project development feasible. Secondly, clean energy developers must now attempt to sell their generated electricity on the open market, a new occurrence for them. Any wind farm developed after 2015 must be structured in a completely different manner to reflect these financial changes. The electrical grid infrastructure requirements of wind energy must contend with these changes as well. In addition to a more competitive electricity market post-Green Electricity Act, the full operation of 400 new wind turbines over the next twenty years requires sophisticated grid operation. Additionally, as the electrical grid becomes more connected to new energy sources across the country, substations and the transmission system will be tested by changing power levels. There must be expanded balancing procedures for dealing with the intermittency of wind energy and other renewable

energy. The interrelated threats of financial feasibility and electrical grid infrastructure requirements will make an immediate impact. However, because wind farm development has finally slowed in Burgenland, these threats also have an understandable

Research Limitations

One of the study's limitations is the restricted number of interview partners. The research captured the perceptions and opinions of 13 stakeholders. It is expected that interviewees represent their firms' opinions or objectives, and communicate in a manner that it is compliant their corporate policies. Secondly, the report would ideally utilize stakeholder interviews with those persons living near Burgenland wind farms. Because of time constraints and the German language barrier, this is beyond the scope of this research. Based on the conducted literature review (done in English), there has been no study directly considering the opinions and levels of acceptance by the Burgenland public towards local wind farm siting and decision making processes. As a result, this limitation serves as a recommendation for future research. Similarly, some interview questions may have been confusing for stakeholders because of English proficiency or translation challenges. Next, a deeper understanding of project financing structures would result in more insight on the subject. It would be beneficial to know more about the lending criteria of banks and other international financing agencies. Lastly, the research does not focus extensively on the potential noise (infrasound) or visual (shadow flicker) impacts made by wind turbines. Important observations are returned through the interviews, and it appears that noise and visual impacts primarily happens on a case-by-case basis resulting from turbine installation, placement, and mitigation measures. This too is beyond the scope of this research and was not assessed. Furthermore, the nature of wind turbine noise and visual impacts is often found to be subjective and scientifically limited.[80,81]

Conclusion

As determined by qualitative and quantitative research, the example of Burgenland, Austria serves as an important case study of successful wind farm development. Guided by the sustainability frameworks of the WWF Austria and the revised TBL paradigm, the research was accomplished through a study of renewable energy and electrical grid policy at multiple levels; thirteen semi-structured stakeholder interviews and thematic analysis of the interview data; and a GIS spatial analysis of the land use considerations faced by local wind farm developer. Based on the results of the research, the final section of the report offers valuable recommendations and broader considerations.

Recommendations

Burgenland's advantageous location for wind energy development is impressive but it is not unique. Globally, comparably high wind resource conditions can be found in areas of low population, primarily agricultural land use. The wind turbine technology found in Burgenland is not exclusive. Wind turbine technology is more or less the same throughout the world, depending on site conditions and project financing, among other influences. Additionally, the Green Electricity Act applies to projects across Austria so long as development is feasible. What differentiates Burgenland and makes it a valuable case study are its policies, decision making

processes, and siting considerations.

Burgenland's policies are effective iterations of greater policy objectives. The Regional Policy Framework for Wind Turbines and the Burgenland 2020 Regional Development Strategy complement and uphold important policies such as the EU Renewable Energy Directive the Austrian Green Electricity Act. Underlying Burgenland's influential policies is the political commitment to clean energy self-sufficiency by Governor Niessl and his administration. As a historically economically stagnant and energy dependent region, Burgenland acted appropriately by leveraging their natural wind resource potential. In doing so, wind farm development did not end up harming ecotourism but rather made it stronger because of expanded environmental protection measures and engagement with environmental organizations. Similarly, cash-strapped farmers benefited while maintaining the functionality of their properties and the integrity of the agriculture industry. From the start, the determination of Governor Niessl has enabled stakeholders to identify mutually acceptable wind energy objectives, leading to increased investment certainty and significant wind farm growth.

Communicative planning efforts have been applied by the government and diverse stakeholders through transparent and inclusive processes. The result is stakeholder buy-in for policy, turbine suitability zones, and permitting procedures. The environmental sustainability measures and spatial planning methods for wind farm development in Burgenland are the direct result of stakeholder engagement and acceptance and political commitment. Partially as a result of this communication structure among multiple stakeholders, Burgenland wind farm development has been implemented to great success and serves as a model in Austria.

Competing objectives of environmental, social, and economic sustainability are acknowledged are integrated into the policies, decision making processes, and siting considerations of Burgenland wind farm development. The balance identified in this case study serves as a model to be utilized by other stakeholders and institutions involved in wind farm development. Should the best practices identified this report be combined with an underlying sustainability framework such as that of the WWF Austria and the TBL paradigm, there is a greater likelihood that wind farm development will be deemed positive. The success story study offered by Burgenland's experience with wind farm development represents one part of the greater transition to renewable energy.

Broader Considerations

The research presented in this report signifies a small but necessary element in the fight against climate change. Wind farm development is situated among a multitude of energy and electricity complexities. New knowledge of sustainable wind energy development must be disseminated so that ineffective and costly barriers can be removed in favor of best practices that support the needs of people and nature. Based on the Burgenland case study, other areas suitable for wind farm development can use a similar research approach. Transnational application will lead to the expanded identification of issues, themes, and perspectives. As the knowledge gap is filled, practical lessons and applications emerge for all relevant stakeholders.

Globally, there is a demonstrated need for ongoing research on the impact of wind farm

development. This may include studying ecosystem impacts for birds and bats. The social acceptance of wind energy is also highly relevant, and may include research in public health. Additionally, the integration of wind power into the electrical grid needs to be understood from the network's perspective of supply and demand. Also important to consider in global wind energy development are the emerging changes to electrical grid infrastructure and utilities. Distributed energy, advances in storage, and new means of energy efficiency further complicate the issue will ultimately benefit wind energy. It is also necessary to have more research on the business models of wind energy developers. As public support schemes end, businesses must evolve and account for new market structures and means of project financing.

Globally, there are significant opportunities to expand wind power in a manner that upholds stakeholder interests. As demonstrated by the Burgenland case study, development should be based on clear social, environmental, and economic criteria. There must be extensive stakeholder engagement and acceptance, stringent environmental sustainability measures, effective spatial planning methods, and a high level of political commitment. As demonstrated in this report, the policies, siting considerations, and decision making processes in Burgenland support the successful and sustainable development of wind farms and related electrical grid infrastructure. As the 400 wind turbines in Burgenland transition into the operations phase, it is equally important to provide outlets for the monitoring of turbine impacts. Because conditions will change, it is important for stakeholders to maintain the same high-quality collaborative approach that initially made development so successful.

References

[1] Thompson, Andrea, and Climate Central. "2015 Begins with CO2 above 400 PPM Mark." *Energy & Sustainability: Climate Central*. Scientific American, 12 Jan. 2015. Web. 02 Mar. 2015.

[2]The levelized cost of energy is defined as the actualized electricity cost over the lifetime of the project, taking into account the value of all components, development capital, and other operating and decommissioning costs incurred by the wind farm owner and developer.

[3] Lacey, Stephen. "This Is What the Utility Death Spiral Looks Like." *Greentechgrid: Grid Edge*. Greentech Media, 4 Mar. 2014. Web. 2 Mar. 2015.

[4] Statistics Austria. "Federal Provinces (Länder)." *Classifications - Regional Breakdowns.* Statistics Austria, 1 Jan. 2014. Web. 7 Mar. 2015.

[5] A statutory city is a city vested with both municipal and district administrative authority.

[6] Statistics Austria Statistical Database - STATcube. "Population at the beginning of the year since 1982." Organized by Time Section, Commune (Aggregation by Political District), and Burgenland. Statistics Austria, 1 Jan. 2014. Web. 7 Mar. 2015.

[7] "*Federal States of Austria*." Scale 1:6,126,929. Shapefiles from ESRI ArcGIS Online World Countries and World Administrative Divisions. Urbana, IL: Daniel Obeler, March 2015. Using *ArcMap* Version 10.2.1 and ArcGIS Online. Redlands, CA: ESRI 2015.

[8] "*Federal States of Austria*." Scale 1:1,119,297. Shapefiles from Office of the Provincial Government of Burgenland, Office of Regional Planning, GeoData Burgenland. Urbana, IL: Daniel Obeler, March 2015. Using *ArcMap* Version 10.2.1. Redlands, CA: ESRI 2015.

[9] The Editors of Encyclopedia Britannica. "Burgenland." *Encyclopedia Britannica Online.* Encyclopedia Britannica, 2 Oct. 2013. Web. 7 Mar. 2015.

[10] Bell, Christina, Karl Schellmann, and WWF Österreich. "Burgenland – A Best Practice Example for a Sustainable Development of Wind Power?" WWF Information - Österreich 2014. Trans. Robert Poth. WWF Österreich, 2014. Web. 8 Mar. 2015.

[11] "One of the reasons for the structural weakness of Burgenland's economy is the nationalism and centralism prevailing in the Hungarian half of the Empire after 1866. The expansion of the Hungarian transport network during the second half of the 19th century was oriented towards Budapest; for political reasons, closer links between the predominantly German-speaking border areas of Western Hungary and the neighboring province of Lower Austria were considered undesirable. For the same reason, there was no special support for the infrastructural and economic development of the Western periphery of the country. This led to an economic "backwardness" of the region with lasting effects on present-day Burgenland until the 1960s. Yet, as one of the side effects, an exceptionally large number of natural habitats were preserved in the region."[12]

[12] Office of the Provincial Government of Burgenland. "Soviet Occupation of the Treaty and the Hungarian Revolution of 1945-1957." *Country History 1945 - 1957.* Office of the Provincial Government of Burgenland, 2014. Web. 7 Mar. 2015.

[13] EUR-Lex. "Objective 1." *Summaries of EU legislation: Provisions and instruments of regional policy*. EUROPA, 14 July 2005. Web. 8 Mar. 2015.

[14] CENTROPE Agency. "CENTROPE at a Glance." *CENTROPE Region*. CENTROPE, 2015. Web. 8 Mar. 2015.

[15] Eurostat and Marek Šturc. "Short Assessment of Renewable Energy Sources (SHARES) 2013 Results – Tables: Summary %, EU28, AT." Eurostat, 9 Mar. 2015. Web. 11 March 2015.

[16] Renewable energy sources cover solar thermal and photovoltaic energy, hydro (including tide, wave and ocean energy), wind, geothermal energy and all forms of biomass (including biological waste and liquid biofuels). The contribution of renewable energy from heat pumps is also covered for the Member States for which this information was reported. The renewable energy delivered to final consumers (industry, transport, households, services including public services, agriculture, forestry and fisheries) is the numerator of this indicator. The denominator, the gross final energy consumption of all energy sources, covers total energy delivered for energy purposes to final consumers as well as the transmission and distribution losses for electricity and heat. The national shares of energy from renewable sources in gross final consumption of energy are calculated according to specific calculation provisions of Directive 2009/28/EC on the promotion of the use of energy from renewable sources and Commission Decision 2013/114/EU establishing the guidelines for Member States on calculating renewable energy from heat pumps from different heat pump technologies. Electricity production from hydro power and wind power is accounted according to normalisation rules of Annex II of Directive 2009/28/EC. For data as of 2011, only biofuels and bioliquids compliant with criteria of sustainability as defined in Articles 17 and

18 of Directive 2009/28/EC are accounted towards the share of energy from renewable sources. Adjustments of energy consumption in aviation are applied for all countries according to Article 5(6). Statistical transfers and joint projects (Articles 6-11) reported to the Eurostat are also considered in the presented data. More details on the calculation methodology applied by Eurostat can be found in the SHARES tool manual: http://ec.europa.eu/eurostat/web/energy/data/shares.

[17] Köchl, Matthias, and Die Grünen. "35 Years 'No' To Zwentendorf." *Energy Transition*. Die Grünen, 5 Nov. 2013. Web. 14 Mar. 2015.

[18] EVN AG and PRIMA VISTA Media & Consulting GmbH. "A film location that is truly unique." *The Nuclear Power Plant Zwentendorf.* PRIMA VISTA Media & Consulting GmbH, 2010. Web. 14 Mar. 2015.

[19] WWF Österreich. "Woher Nehmen Wir Die Energi?" *Panda Magazin Issue 4*. WWF Österreich, 2014. Web. 15 Mar. 2015.

[20] Example of large-scale solar systems: In 2009, the site of the Zwentendorf nuclear plant in the Federal State of Lower Austria was reopened by EVN Group as a solar power station providing approximately 180 MWh of electricity per year. Since 2011, Alba Solar GmbH operates a 2 MW PV system in the Low Tauern mountain range in the Federal State of Styria.

[21] E-Control. "Operational Statistics 2013 – Total Electricity Supply: Annual Production for Components ." E-Control, Aug. 2014. Web. 13 March 2015.

[22] IG Windkraft. "Das realisierbare Windpotential Österreichs für 2020 und 2030 (Study of Austria's Wind Potential for 2020 and 2030)." 18 Sep. 2014. Web. 17 Oct. 2014.

[23] IG Windkraft. "Wind in Numbers." Jan. 2014. Web. 15 Oct. 2014.

[24] Fliegenschnee-Jaksch, Martin, and IG Windkraft. "Wind Power in Burgenland." *Press Release.* IG Windkraft, 26 Nov. 2014. Web. 20 Dec. 2014.

[25] Schubaschitz, Viola and Energie Burgenland Windkraft GmbH. "Energie Burgenland Windkraft GmbH." Community Presentation, 12 Jan. 2014. Personal Interview, 1 Dec. 2014.

[26] Fliegenschnee-Jaksch, Martin, and IG Windkraft. "400th Wind Turbine in Burgenland Is "Julia"" Press Release. IG Windkraft, 26 Nov. 2014. Web. 20 Dec. 2014.

[27] Schreuer, Anna. "Energy cooperatives and local ownership in the field of renewable energy – Country Cases Austria and Germany." *Research Institute for Co-operation and Cooperatives (RiCC), Vienna University of Economics and Business (WU)* (2012): n. pag. Web. 12 Dec. 2014.

[28] Łukasik, Aleksandra. "Influence of Regulatory Risks on Private Investments in Wind Energy – A Financial Investor's Perspective." *Master's Thesis, Vienna University of Economics and Business (WU)* (2014): n. pag. Web. 19 Mar. 2015.

[29] Hampl, Nina, Wüstenhagen, Rolf. "Management of Investor Acceptance in Wind Power Megaprojects: A Conceptual Perspective." *Organization, Technology & Management in Construction: An International Journal* 4. (Special Issue 2013): 571-583. Web. 6 Sep. 2014.

[30] Brittan Jr., Gordon G. "Wind, energy, landscape: reconciling nature and technology." *Philosophy & Geography* 4.2 (2001): 169-184. Web. 12 Oct. 2014.

[31] Wolsink, Maarten. "Wind power implementation: the nature of public attitudes: equity and fairness instead of 'backyard motives'." *Renewable and Sustainable Energy Reviews* 11.6 (2007): 1188-1207. Web. 12 Oct. 2014.

[32] Birnie, Richard V., Osman, Christopher H., Leadbeater, Susan, and Smith, Malcom. "A review of the current status of wind energy developments in Scotland." *The Scottish Geographical Magazine* 115.4 (1999): 283-295.

[33] Haggett, Claire. "Over the sea and far away? A consideration of the planning, politics and public perception of offshore wind farms." *Journal of Environmental Policy & Planning* 10.3 (2008): 289-306. Web. 23 Sep. 2014.

[34] Wüstenhagen, Rolf, Wolsink, Maarten, and Mary Jean Bürer. "Social acceptance of renewable energy innovation: An introduction to the concept." *Energy policy* 35.5 (2007): 2683-2691. Web. 8 Dec. 2014.

[35] Forester, John. "Planning in the Face of Conflict: Negotiation and Mediation Strategies in Local Land Use Regulation." *Journal of the American Planning Association* 53.3 (1987): 303-314. Web. 6 July. 2014.

[36] Healey, Patsy. "A Planner's Day: Knowledge and Action in Communicative Practice." *Journal of the American Planning Association* 58.1 (1992): 9-20. Web. 6 Jul. 2014.

[37] Gass, Viktoria, et al. "Assessing the economic wind power potential in Austria." *Energy Policy* 53 (2013): 323-330. Web. 11 Nov. 2014.

[38] According to the definition by the International Energy Agency, the LCOE is equal to the present value of the sum of discounted costs divided by total production adjusted for its economic time value, which reflects the investors return on capital. Gass et al. (2012) use this definition to reflect the electricity price needed to break even on a wind energy investment project, and assume a fixed interest rate over the project's lifetime. Here, the authors identify a limitation to their spatial research on economic viability. Power grid network connection costs have only been considered as a fixed amount and not location specific. Since most of the identified sites are in the eastern and southern part of Austria, where the power grid is well expanded and most wind turbines are installed, no significant impact on the LCOE was expected.

[39] EUR-Lex. "Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC." EUR-Lex, 23 Apr. 2009. Web. 14 Oct. 2014.

[40] European Commission. "The Internal Market – Ten Years Without Frontiers." *European Union*, 2003. Web. 14 Oct. 2014.

[41] Zademach, Hans-Martin, and Andrés Rodríguez-Pose. "Cross-border M&As and the changing economic geography of Europe." *European Planning Studies* 17.5 (2009): 765-789. Web. 14 Oct. 2014.

[42] EUR-Lex. "Report from the Commission to the European Parliament, the Council, the European Economic and Social Committee of the Regions – Renewable Energy Progress Report." EUR-Lex, 27 Mar. 2013. Web. 14 Oct. 2014.

[43]The European Network of Transmission System Operators for Electricity (ENTSO-E) is a legally mandated association of Member State transmission system operators (TSOs) to ensure continental electricity networks that benefit customers and shape energy policy in areas of security, wholesale and retail markets, sustainability, and network adequacy. TSOs are independent entities but are highly regulated and neutral within energy markets. As such, ENTSO-E provides TSOs, regulators, policy makers, market participants, and the public with information, analyses and proposals, and initiatives that enable efficient and effective TSOs. ENTSO-E coordinates TSOs' actions in operation, system development, market development, and research; promotes completion and functioning of the internal energy market in electricity and cross-border trade; participates in European rule setting process (in compliance with EU legislation, network codes, and Member States Ten-Year Network Development Plans). ENTSO-E is supported by European Commission Regulation No. 714/2009 of the European Parliament and of the Council, as of July 13, 2009, on conditions for access to the network for cross-border exchanges in electricity and repealing Regulation European Commission No. 1228/2003. Additionally, ENTSO-E is supported by European Commission Regulation No. 347/2013 of the European Parliament and of the Council, as of April 17, 2013, for guidelines for trans-European energy infrastructure and repealing Decision No 1364/2006/EC, and amending European Commission No. 713/2009, European Commission No. 714/2009, and European Commission No. 715/2009. For more information: https://www.entsoe.eu/Pages/default.aspx

[44] European Wind Energy Technology Platform. Coor. Manuela Conconi, European Wind Energy Association. *Strategic Research Agenda/Market Deployment Strategy (SRA/MDS)*. European Wind Energy Technology Platform, Mar. 2014. Web. 16 Nov. 2014.

[45]The Trans-European Energy Networks (TEN-E) strategy is intended to promote a resource-efficient, sustainable, and more competitive economy through energy infrastructure efforts. This includes modernized and expanded networks with interconnection points across borders, in particular to integrate renewable energy sources. 12 regional groups have been established to support projects in priority cooridors. After 2015, no Member State will be isolated from the continental gas and electricity networks. As mentioned, programs include energy infrastructure projects of common interest (PCI) with access to financial support from the Connecting Europe Facility (CEF). TEN-E is the result of European Commission Regulation No. 347/2013 of the European Parliament and of the Council, as of April 17, 2013, for guidelines for trans-European energy infrastructure and repealing Decision No 1364/2006/EC and amending European Commission No. 713/2009, European Commission No. 714/2009, and European Commission No. 715/2009. For more information: http://ec.europa.eu/energy/en/topics/infrastructure

[46]The European Electricity Grid Initiative (EEGI) is one of the European Industrial Initiatives (EIIs), found under the European Commission's Strategic Energy Technologies Plan (SET-PLAN). The EEGI proposes a nine year research, development, and demonstration (RD&D) program to accelerate innovation and the development of modernized electricity networks. Rather than technology innovation, the EEGI focuses on system innovation to ensure the transformation and optimization of electricity networks when integrating a high share of renewable energy sources. The EEGI addresses the challenge of integrating new technologies under actual working conditions and validating the results. As found in other EIIs, this work pushes Member States, industry, and

researchers to promote key energy technologies through shared funding, skills, and research facilities. For more information: http://www.smartgrids.eu/European-Electricity-Grid-Initiative

[47]The New Entrants Reserve (NER300) is a market-based funding program managed jointly by the European Commission, the European Investment Bank, and Member States, so-called because it sets aside 300 million allowances (the right to emit one ton of CO_2) for the European ETS. NER300 allows for the subsidization of innovative renewable energy installations and carbon capture and storage programs. The allowances have been sold on the carbon market and the money raised, €2.1 billion, is made available to projects as they operate. The first call for projects took place in April 2013 and the second call occurred one year later. Wind energy has 6 categories: onshore wind projects in cold climates and complex terrains; offshore wind floating systems and offshore wind farms with minimum turbine size of 6MW, 8MW and 10MW. Windpark Handalm is the only Austrian project to have been accepted thus far. This 11-turbine project, in the mountainous region of Styria, aims to demonstrate the large scale application of a wind turbine generator optimized for the special wind and site conditions of high-altitude locations. NER300 is supported by Directive 2009/29/EC of the European Parliament and of the Council, as of April 23, 2009, amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community. For more information: http://www.ner300.com/

[48]ENTSO-E is responsible for the creation of the biennial Ten Year Network Development Plan (TYNDP), which identifies impacts, gaps, and investments in electricity network infrastructure. The TYNDP builds on national and regional investment plans (RIPs) to better inform Member State decision-makers and stakeholders as well as the overall European internal energy market. TYNDP is intended to be the central instrument for network investment decision-making. It includes ENTSO-E's Scenario Outlook and Adequacy Forecast (SOAF) to asses and forecast long-term generation adequacy and provides base scenarios for market and network studies. For more information: https://www.entsoe.eu/major-projects/ten-year-network-development-plan/tyndp-2014/Pages/default.aspx

[49] European Commission. “Projects of Common Interest (PCI).” EUROPA, 2013. Web. 14 Oct. 2014.

[50] Hall, Max. “EU Energy Infrastructure Budget Halved by Austerity Drive.” PV Magazine, 15 Mar. 2013. Web. 17 Oct. 2014.

[51]22 PCI are located in Austria. Predominantly, this includes electricity storage and high-voltage lines from hydropower in the west, some and natural gas and oil pipeline projects in the east.

[52] Energie-Control Austria. “Bundesgesetz über Die Förderung Der Elektrizitätserzeugung Aus Erneuerbaren Energieträgern (Federal Act on Supporting Electricity Produced from Renewable Energy Sources),” also known as Ökostromgesetz, ÖSG 2012, and Green Electricity Act. Bundesgesetzblatt (Federal Law Gazette), Volume I No. 75/2011 and No. 11/2012. Energie-Control Austria, 08 Jan 2013. Web. Non-binding English version. 14 Oct. 2014.

[53]For such applicants, if these plants would be contracted in the calendar years 2012 or 2013, 9.7 €¢/kWh is OeMAG’s rate. For plants that would be contracted by OeMAG in 2014 or later, the rate is 9.5 €¢/kWh. The additional annual support funds needed for each individual application is calculated by multiplying the plant's green electricity output during a calendar year by the difference between the green power settlement agent's expenses (corresponding to the applicable FIT, any applicable mark-ups, and the prorated expenses pursuant to ÖSG 2012 Section 42) and the market price (the average of the four quarterly electricity baseload market prices from the preceding calendar year, as determined by the European Energy Exchange). The annual output used to calculate the additional annual support funds needed is calculated by multiplying the maximum capacity recorded in the official accreditation notice by the average annual full-load hours for this type of green power plant.

[54] The Legal Information System of the Republic of Austria. “Langtitel Verordnung des Bundesministers für Wirtschaft, Familie und Jugend, mit der die Einspeisetarife für die Abnahme elektrischer Energie aus Ökostromanlagen auf Grund von Verträgen festgesetzt werden, zu deren Abschluss die Ökostromabwicklungsstelle ab 1 Juli 2012 bis Ende des Jahres 2015 verpflichtet ist (Regulation of the Minister of Economy, Family and Youth, with the feed-in tariffs for the purchase of electricity from renewable generating capacity under contracts are fixed to their statements, the Clearing and Settlement Agency is required from 1 July 2012 until the end of 2015),” also known as Ökostrom-Einspeisetarifverordnung 2012 (ÖSET-VO 2012). Bundesgesetzblatt (Federal Law Gazette), Volume II No. 307/2012 and Nr. 503/2013. The Legal Information System of the Republic of Austria, 23 Dec. 2013. Web. 14 Oct. 2014.

[55]OeMAG is responsible for concluding contracts with control area managers, system operators, generators, and traders; the assignment of green electricity to traders; data exchange with the Climate Change and Energy Fund, E-Control, and related institutions; forecasting green electricity feed-in; deriving schedules for the electricity to be

purchased or sold based on the type and scope of balance group projections; ensuring that the share of green power, in final consumption, is the same across all green power groups; monitoring that plant operators comply and fulfill their tasks; adhering to market rules; and minimize the expenditures of balancing energy. The Minister of Economy, Family and Youth is responsible for oversight of OeMAG. OeMAG is also subject to scrutiny by the Austrian Court of Audit, and annually submits a report about its activities to the Energy Advisory Council.

[56] According to the Electricity Industry and Organization Act (2010), amended in 2013: Balance group means the combination of suppliers and customers in a virtual group within which injection (procurement schedule, generation) and withdrawal (delivery schedule, demand) are balanced.

[57] According to the Electricity Industry and Organization Act (2010), amended in 2013: Electricity trader means a natural or legal person or a registered partnership selling electricity with a view to profit.

[58] Collection of the renewables contribution is through the system operators on their system charges bills. Low-income households, those persons eligible through the Telephone Charges Subsidies Act), are capped at paying €20 towards the renewables contribution.

[59] European Commission. "State Aid: Commission Approves Austrian Support Scheme for Renewable Energies '2012 Green Electricity Act.'" EUROPA, 08 Feb. 2012. Web. 14 Oct. 2014.

[60] Energie-Control Austria. "Elektrizitätswirtschafts und Organisationsgesetz (Electricity Industry and Organization Act)." Bundesgesetzblatt (Federal Law Gazette), Volume I No. 110/2010 and No. 174/2013. Energie-Control Austria, 1 Jan 2014. Web. Non-binding English version. 14 Oct. 2014.

[61] According to the Electricity Industry and Organization Act (2010), amended in 2013: Control area manager means the entity which is responsible for load frequency control within a control area, where this function may also be carried out by a third-party company having its domicile in another member state of the European Union. Control area means the smallest unit within the interconnected system in which load frequency control is available and used.

[62] Kanonier, Arthur and Schönegger, Claudia. "Surface Representations for Line Infrastructure Projects: Basics, Actions, and Solutions." Austrian Conference on Spatial Planning (ÖROK). ÖROK Publication No. 189, Sept. 2013. Web. 13 Dec. 2014.

[63] Sustainable Development, a service of the Austrian Federal Ministry for Transport, Innovation and Technology. "About ENERGIE 2050." Sustainable Development, Apr. 2015. Web. 07 Apr. 2015.

[64] Siska, Jakub. "A 100% Renewable Burgenland." Daily Newspaper for Renewable Energy and Sustainability. Oekonews, 22 Sept. 2014. Web. 02 Nov. 2014.

[65] Horvath, Harald and Regionalmanagement Burgenland GmbH. "The Development Strategy Burgenland 2020." Regionalmanagement Burgenland Phasing Out Program, 2015. Web. 18 Apr. 2015.

[66] Regionalmanagement Burgenland GmbH. "Burgenland 2020 Regional Development Strategy." Regionalmanagement Burgenland, 31 May 2012. Web. 18 Apr. 2015.

[67] Austrian Power Grid (APG). "Network Development Plan 2014." APG, 2015. Web. 15 Dec. 2014.

[68] APG. "Energy Systems Undergoing Radical Change." News & Press. Austrian Power Grid, 30 Sept. 2013. Web. 20 Oct. 2014.

[69] Aberle, Sven, and Christoph Bruny. "380 KV Line at Dürnrohr - Vienna Southeast." APG Projects. APG, 2015. Web. 18 Apr. 2015.

[70] Energie Burgenland. "300 Ton Heavy Transport Arrives in Zurndorf." Press Releases. Energie Burgenland, Oct. 2012. Web. 18 Apr. 2015.

[71] APG. "Effects of Grid Expansion." Market Information and Cross-Border Exchange. APG, 2012. Web. 18 Apr. 2015.

[72] Casey, Zoë. "Seventy Seven Percent of Austrians Favour Wind Power." *EWEA Blog*. European Wind Energy Association, 13 May 2013. Web. 22 Mar. 2015.

[73] Schubaschitz, Viola and Energie Burgenland Windkraft GmbH. "Energie Burgenland Windkraft GmbH." Community Presentation, 12 Jan. 2014. Personal Interview, 1 Dec. 2014.

[74] *Research Studios Austria Forschungsgesellschaft mbH*. "AuWiPot – Wind Atlas Austria." Data from Dr. Markus Biberacher, Research Studio iSPACE. 3 Dec. 2014. E-mail.

[75] Jarvis, A., Reuter, H.I., Nelson, A., Guevara, E. "Hole-filled Shuttle Radar Topographic Mission (SRTM) for the globe Version 4." Consultative Group for International Agricultural Research – Consortium for Spatial Information (CGIAR-CSI) SRTM 90m Database, 2008.

[76] For Figure 19: Land Use Considerations, the GIS data sources are as follows: Federal State Administrative Districts (http://www.esri.com/data/find-data); Austria national border (http://www.esri.com/data/find-data); APG 220 kV transmission line (georeferenced to map of APG 380 kV network found at http://tinyurl.com/APG-Ring);

APG 380 kV transmission line (georeferenced to map of APG 380 kV network found at http://tinyurl.com/APG-Ring); railroads (http://www.diva-gis.org/gData); major roads (http://www.diva-gis.org/gData); water networks (http://www.diva-gis.org/gData); water bodies (http://www.diva-gis.org/gData); municipalities (http://www.statistik.at/web_en/classifications/regional_breakdown/locality/index.html); EU Corine Land Cover 2006 for marshes and wetlands, non-irrigated arable land, vineyards, pastures, land principally owned by agriculture, natural grassland, mixed forest, broad-leaved forest, coniferous forest (http://www.eea.europa.eu/data-and-maps/data/clc-2006-vector-data-version-3); and wind turbines (Energie Burgenland Windkraft GmbH).

[77] For Figure 20: Land Use Considerations with EU Natura 2000 Sites, the GIS data sources are as follows: Federal State Administrative Districts (http://www.esri.com/data/find-data); Austria national border (http://www.esri.com/data/find-data); APG 220 kV transmission line (georeferenced to map of APG 380 kV network found at http://tinyurl.com/APG-Ring); APG 380 kV transmission line (georeferenced to map of APG 380 kV network found at http://tinyurl.com/APG-Ring); railroads (http://www.diva-gis.org/gData); major roads (http://www.diva-gis.org/gData); water networks (http://www.diva-gis.org/gData); water bodies (http://www.diva-gis.org/gData); EU Natura 2000 (http://www.eea.europa.eu/data-and-maps/data/natura-5#tab-gis-data);municipalities (http://www.statistik.at/web_en/classifications/regional_breakdown/locality/index.html); wind turbines (Energie Burgenland Windkraft GmbH); and EU Corine Land Cover 2006 for marshes and wetlands, non-irrigated arable land, vineyards, pastures, land principally owned by agriculture, natural grassland, mixed forest, broad-leaved forest, coniferous forest (http://www.eea.europa.eu/data-and-maps/data/clc-2006-vector-data-version-3)

[78] For Figure 21: Required Distance from Municipalities, the GIS data sources are as follows: Federal State Administrative Districts (http://www.esri.com/data/find-data); Austria national border (http://www.esri.com/data/find-data); APG 220 kV transmission line (georeferenced to map of APG 380 kV network found at http://tinyurl.com/APG-Ring); APG 380 kV transmission line (georeferenced to map of APG 380 kV network found at http://tinyurl.com/APG-Ring); railroads (http://www.diva-gis.org/gData); major roads (http://www.diva-gis.org/gData); water networks (http://www.diva-gis.org/gData); water bodies (http://www.diva-gis.org/gData); EU Natura 2000 (http://www.eea.europa.eu/data-and-maps/data/natura-5#tab-gis-data);municipalities (http://www.statistik.at/web_en/classifications/regional_breakdown/locality/index.html); municipalities buffer (stakeholder interviews and Burgenland's Regional Policy Framework for Wind Turbines); (Energie Burgenland Windkraft GmbH); and EU Corine Land Cover 2006 for marshes and wetlands, non-irrigated arable land, vineyards, pastures, land principally owned by agriculture, natural grassland, mixed forest, broad-leaved forest, coniferous forest (http://www.eea.europa.eu/data-and-maps/data/clc-2006-vector-data-version-3)

[79] Figure 22: North Burgenland – Recommended Proximity to the APG Electrical Grid, the GIS data sources are as follows: Federal State Administrative Districts (http://www.esri.com/data/find-data); Austria national border (http://www.esri.com/data/find-data); APG 220 kV transmission line (georeferenced to map of APG 380 kV network found at http://tinyurl.com/APG-Ring); APG 380 kV transmission line (georeferenced to map of APG 380 kV network found at http://tinyurl.com/APG-Ring); APG substation line (georeferenced to map of APG 380 kV network found at http://tinyurl.com/APG-Ring); railroads (http://www.diva-gis.org/gData); major roads (http://www.diva-gis.org/gData); water networks (http://www.diva-gis.org/gData); water bodies (http://www.diva-gis.org/gData); EU Natura 2000 (http://www.eea.europa.eu/data-and-maps/data/natura-5#tab-gis-data);municipalities (http://www.statistik.at/web_en/classifications/regional_breakdown/locality/index.html); municipalities buffer (stakeholder interviews and Burgenland's Regional Policy Framework for Wind Turbines); (Energie Burgenland Windkraft GmbH); and EU Corine Land Cover 2006 for marshes and wetlands, non-irrigated arable land, vineyards, pastures, land principally owned by agriculture, natural grassland, mixed forest, broad-leaved forest, coniferous forest (http://www.eea.europa.eu/data-and-maps/data/clc-2006-vector-data-version-3)

[80] As of November 2014, the federal department Health Canada concluded there is no evidence of a causal relationship between exposure to wind turbine noise and self-reported medical illnesses and health conditions; no association between multiple measures of stress and exposure to wind turbine noise; no association between wind turbine noise and self-reported or measured sleep quality; and no association between wind turbine noise and any significant changes in reported quality of life, or with overall quality of life, and satisfaction with health. The study did find a correlation but not a causal relationship between increasing levels of wind turbine noise and annoyance. A number of factors may contribute to annoyance levels, including economic benefit, visual appearance and noise sensitivity. According to Health Canada, this is the first study related to wind turbine noise to implement the use of both self-reported and physically measured health endpoints.

[81] Health Canada and Statistics Canada. "Wind Turbine Noise and Health Study: Summary of Results." *Environmental and Workplace Health*. Health Canada, Oct. 30 2014. Web. November 7, 2014.

Appendix A

Administrative Structure and Population of Austrian Federal States

Federal State	Area (km^2)*	Districts		Judicial Districts	Municipalities	Resident Population
		Statutory Cities	Political Districts			January 1, 2014
Vienna	414.65	1	-	12	1	1,766,746
Lower Austria	19,186.26	4	21	24	573	1,625,485
Upper Austria	11,979.91	3	15	18	444	1,425,422
Styria	16,401.04	1	12	18	287	1,215,246
Tyrol	12,640.17	1	8	13	279	722,038
Carinthia	9,538.01	2	8	11	132	555,881
Salzburg	7,156.03	1	5	9	119	534,270
Vorarlberg	2,601.12	-	4	6	96	375,282
Burgenland	3,961.80	2	7	7	171	287,416
Austria	**83,878.99**	**15**	**80**	**118**	**2,102**	**8,507,786**

Statistics Austria. "Federal Provinces (Länder)." Classifications - Regional Breakdowns. Statistics Austria, 1 Jan. 2014. Web. 07 Mar. 2015.

Appendix B

Administrative Districts and Population of Burgenland

Administrative District	Population January 1, 2014
Neusiedl am See	56,504
Oberwart	53,573
Eisenstadt-Umgebung	41,474
Mattersburg	39,134
Oberpullendorf	37,534
Güssing	26,394
Jennersdorf	17,376
Eisenstadt	13,485
Rust	1,942
Burgenland	**287,416**

Statistics Austria Statistical Database - STATcube. "Population at the beginning of the year since 1982." Organized by Time Section, Commune (Aggregation by Political District), and Burgenland. Statistics Austria, 1 Jan. 2014. Web. 07 Mar. 2015.

Appendix C

EU Energy R&D Funding from FP1 – Horizon 2020

EU Framework Program for Research	EU FP for Research Overall Budget (€ million)	FP-Energy (non-nuclear) Budget (€ million)	Share of FP-Energy in the Overall FP Budget	Wind Energy Funding (€ million)	Share of Wind Energy in FP Energy Funding
FP1: 1984 - 1987	2,810	830	29.50%	45.80	5.50%
FP2: 1987 - 1991	4,345	122	2.80%	7.59	6.20%
FP3: 1990 - 1994	5,804	267	4.60%	58.82	22%
FP4: 1994 - 1998	11,879	1,076	9.10%	44.10	4.10%
FP5: 1998 - 2002	13,700	1,042	7.60%	70.00	6.70%
FP6: 2002 - 2006	17,833	890	5.00%	39.00	4.40%
FP7: 2007 - 2013	50,521	2,350	4.70%	168.60	7.20%
Horizon 2020: 2014 - 2020	77,028	5,931	7.70%	-	-

DG R&I, EC Cordis database. "Council Decisions on EU FP Research." Found in European Wind Energy Association "Strategic Research Agenda/Market Deployment Strategy (SRA/MDS)." Mar. 2014. Web. 16 Nov. 2014.

Appendix D

Federal Act on Supporting Electricity Produced from Renewable Energy Sources

Green Electricity Act, Title 1: General Provisions, Section 4: Objectives, Paragraphs 1 – 5

(1) In the interest of climate and environmental protection as well as security of supply the objectives of this Federal Act are:

1. To promote the generation of green electricity in plants in Austria in line with the principles of European Union law;
2. To reach at least the shares of electricity produced from renewable energy sources stipulated in paras 2 through 4;
3. To ensure that green electricity production is energy efficient;
4. To make efficient use of the support funds for renewable energy;
5. To make the commercial maturity of green electricity generation technologies a technological policy objective, while bearing in mind European policies on renewables technologies in general and those contained in the Strategic Energy Technology (SET) plan in particular;
6. To ensure a secure investment climate for existing and future plants;
7. To eliminate Austria's dependence on nuclear energy imports from the energy balance by 2015.

(2) The construction and expansion of plants shall be supported to such an extent that stations which receive support (either because of a purchasing obligation by the green power settlement agent or because they are eligible for investment aid) account for 15% of the electricity supplied to consumers from public grids by 2015. The electricity produced from newly constructed small and medium-scale hydropower plants, as well as the additional production achieved through optimization and expansion of existing small-scale hydropower plants since the Ökostromgesetz (Green Electricity Act), FLG I no 149/2002, entered into force, shall be counted towards this target, with the exception of electricity produced in newly constructed or expanded hydropower plants with a maximum capacity of more than 20 MW, which shall not be included.

(3) To increase the amounts of electricity produced from renewable energy sources there shall be efforts for the quantitatively effective construction of the following capacity between 2010 and 2015:

1. 700 MW in hydropower (with additional green electricity output of 3,500 GWh in a normal year, including the effects of rehabilitation measures and expansions of existing installations), of which 350 MW in small and medium-scale hydropower plants (with additional green electricity output of 1,750 GWh in a normal year);
2. 700 MW in wind power (with additional green electricity output of 1,500 GWh in an average year);
3. 500 MW in solar PV (with additional green electricity output of approximately 500 GWh in an average year);
4. 100 MW in biomass or biogas (with additional green electricity output of 600 GWh in an

average year), if there is demonstrable fuel and feedstock availability.

(4) The following expansion targets apply for the period from 2010 to 2020:

1. Hydro: 1000 MW (corresponding to additional green electricity output of approximately 4 TWh in an average year), subject to the availability of sites;
2. Wind: 2000 MW (corresponding to additional green electricity output of approximately 4 TWh in an average year), subject to the availability of sites;
3. Solar PV: 1200 MW (corresponding to additional green electricity output of approximately 1.2 TWh);
4. Biomass and biogas: 200 MW (corresponding to additional green electricity output of approximately 1.3 TWh in an average year), subject to the demonstrable availability of fuel and feedstock.

(5) In accordance with section 51 para. 1, E-Control shall biennially monitor the degree to which the targets laid down in paras 1 through 4 above have been attained. Should the targets be achieved ahead of schedule, the Minister of Economy, Family and Youth shall initiate a government bill to raise them.

As amended: January 8, 2013

Appendix E

Federal Act on Supporting Electricity Produced from Renewable Energy Sources Green Electricity Act, Title 3: Subsidies to Operation, Chapter 3: Feed-in Tariffs, Section 20: Principles for Setting the Feed-in Tariffs, Paragraphs 1 – 5

(1) In accordance with the goals of this Federal Act, and in particular with a view to efficient deployment of financial resources, the feed-in tariffs shall be so designed as to foster a continuous increase in green power generation, while the intention to increase the production of green power using fuel- or feedstock-dependent technologies is subject to proof of secure fuel and feedstock supplies.

(2) Within the limits stipulated in para. 1, the following principles shall be applied when setting the feed-in tariffs:

1. Feed-in tariffs shall respect Union law;
2. Feed-in tariffs shall be guided by the average production costs of cost-efficient plants that comply with the state of the art;
3. Distinction shall be made between plants whenever they differ in terms of costs or have been granted public financial support;
4. Feed-in tariffs shall depend on the various primary energy sources used, with due regard to technical and economic efficiency;
5. Feed-in tariffs shall reflect the situation at the most efficient locations and ensure that splitting capacity into several plants does not lead to higher feed-in tariffs;
6. Feed-in tariffs may further differentiate between plants according to their maximum capacity, annual output (bands) or other technical parameters. It is also possible to introduce time-based differentiation by day/night and summer/winter within the meaning of section 25 Elektrizitätswirtschafts- und -organisationsgesetz (Electricity Act);
7. The ordinance may also specify minimum requirements concerning the technologies used; these minimum requirements shall reflect the state of the art;
8. The ordinance may set a higher fuel efficiency than that in section 12 para. 4 item 4 as an eligibility criterion for feed-in tariffs if this is economically reasonable considering the type of plant, the state of the art and the most efficient use of the primary energy concerned.

(3) For PV plants, the following principles apply in addition those in para. 2 above:

1. Feed-in tariffs for PV plants may differentiate between standalone devices and building integrated panels, while support may be restricted to the latter;
2. Feed-in tariffs pursuant to para. 1 for PV plants with a maximum capacity of up to 20 kW peak may be set to cover only part of the average production costs of cost efficient plants that comply with the state of the art;
3. The ordinance shall specify a uniform feed-in tariff for PV plants of all sizes, while investment aid and feed-in tariffs may be combined and while account shall be taken of whether the previous year's additional annual support volume was exhausted or not;
4. Eligibility for support may be limited to plants up to a certain size, while PV plants with a

minimum capacity of more than 500 kW peak may not be supported in any case.

(4) For fuel- or feedstock-dependent plants, the following principles apply in addition those in para. 2 above:

1. Feed-in tariffs may not cause biomass to be redirected away from non-energetic uses or cause food or animal feed to be redirected from their original intended purpose;
2. Distinction shall be made between waste with high biogenic shares and other types of solid biomass;
3. Distinction may be made between different types of biogas plants (depending on their energy sources and substrates), and also between different types of biomass plants (depending on their energy sources or on other special technical specifications);
4. Feed-in tariffs for biogas or liquid biomass plants may include fuel or feedstock prices (i.e. expenses related to the energy source) only to the extent that they do not exceed the electricity market revenues, as indicated by the market prices most recently published pursuant to section 41para. 1; for plants operating on solid biomass, this applies if the capacity for which a contract has been concluded pursuant to section 15 in conjunction with section 12 or in accordance with the Ökostromgesetz (Green Electricity Act), FLG I no 149/2002, as amended by FLG I no 104/2009, reaches or exceeds 100 MW;
5. To ensure that food and animal feed are not redirected from their original intended purpose, the ordinance may specify that the green power settlement agent's obligation to contract certain types of biogas plant at the set feed-in tariffs applies only if they employ a certain percentage of animal manure for generating green electricity.

(5) Determination of the average production costs shall make reference to the costs of an efficiently managed undertaking which finances a plant under financial market conditions and makes use of other financing options. Useful life, investment cost, operating cost, adequate return on investment and the amount of electricity produced per year shall be taken into account. When determining these costs, national as well as international experience shall be taken into account.

As amended: January 8, 2013

Appendix F

Electricity Infrastructure Development based on Renewable Energy Directive 2009/28/EC, Article 16, Section 1 and Article 16, Sections 3 – 6, as outlined in Austria's National Renewable Energy Action Plan (2010)

a) Reference to existing national legislation concerning requirements related to the energy grids (Article 16):

The Elektrizitätswirtschafts und Organisationsgesetz (Electricity Industry and Organization Act, ElWOG, BGBl. I No 143/1998, BV: BGBl. I No 112/2008) provides the current legal foundation concerning energy networks.

b) How is it ensured that transmission and distribution grids will be developed with a view to integrating the targeted amount of renewable electricity while maintaining the secure operation of the electricity system? How is this requirement included in the transmission and distribution operators' periodical network planning?

The task and responsibility of the system operator is to install electrical power units in accordance with EIWOG and the Systemnutzungstarife-Verordnung (Systems Charges Order, E-Control, SNT-VO) while considering the Technical and Organizational Rules for Operators and Users of Networks (TOR) as defined by E-Control, the government regulator for electricity and gas. Among the responsibilities of the system operator in accordance with EIWOG is to ensure the supply to customers. Transmission and distribution operators must take the necessary precautions and integrate them into their regular network planning.

c) What will be the role of intelligent networks, information technology tools and storage facilities? How will their development be ensured?

Real-time measurements of energy consumption should improve the planning and network optimization. Peak capacities of the pumped storage hydropower stations are increased. Investments in the network infrastructure are considered within the context of the incentive regulation through an investment factor at a reasonable level.

d) Is the reinforcement of the interconnection capacity with neighboring countries planned? If so, which interconnectors, for which capacity and by when?

A reinforcement of transmission grid capacities is envisaged which, amongst other things, also includes a reinforcement of the interconnection capacity with neighboring countries. Under the Masterplan Netz (Association, APG, 2010) of the Austrian Power Grid AG (APG), the following plans are currently being prepared in detail:

- 380-kV Salzburg line 1 (Salzach neu – St. Peter)
- 380-kV Salzburg line 2 (Tauern – St. Peter)
- The support of the second system into Hungary and the integration of wind energy in Burgenland

- Grid reinforcement for the connection of wind energy in Weinviertel and increased coverage in Lower Austria
- Grid reinforcement in the Carinthia area
- Grid reinforcement in Germany
- Conversation of the Danube rail to 380 kV
- Reinforcement of West Tyrol – Zell/Ziller

As the above list shows, this includes, in terms of interconnection capacities with Austria's neighboring countries, an expansion into Hungary as well as grid reinforcement to Germany. Specific reference to the timeframe of implementation and corresponding capacities can however only take place after the detailed planning phase has been concluded.

e) How is the acceleration of grid infrastructure authorization procedures addressed? What is the current state and average time for getting approval? How will it be improved? (Please refer to current status and legislation, bottlenecks detected and plans to streamline procedure with timeframe of implementation and expected results.)

The construction of internal electric power lines generally requires approval by a state government in accordance with the respective implementation laws; for cross-state electric power lines the Federal Ministry of Economy, Family and Youth (BMWFJ) is responsible for this purpose in accordance with the Starkstromwegegesetz (Electric Power Lines Act, BGBl. I No 70/1968 BV. BGBl. I No 112/2003). Furthermore, besides plant authorization, it also requires under the circumstances the granting of rights of passage (on third-party property). Other lines generally only require a possible granting of rights of passage in accordance with implementation laws.

Due to different jurisdictions, no general statements can be made as to procedure times and therefore also no details on their acceleration.

f) How is coordination between grid infrastructure approval and other administrative planning procedures ensured?

For overhead electric power lines with a voltage of 220 kV or more and a length of more than 15 km, the approval procedures are subject to the Environmental Impact Assessment Act (EIA Act, BGBl. No 697/1993 BV BGBl. I No 87/2009) in which a One-Stop-Shop-System is established.

To some extent, permit and tax liability under states' Gebrauchsabgabegesetz (laws on fees for usage) may be applied together. In any case, nature conservation law is cumulatively applicable for electric current lines, in accordance with the stipulation of the building code if need be the Urban Planning and Building Law. In principle there is no accumulation for other lines.

g) Are priority connection rights or reserved connection capacities provided for new installations producing electricity from renewable energy sources?

The extension schemes for wind and hydropower, which represents the largest extension schemes for renewable energies in the next ten years, has led to corresponding preparations by

system operators.

Pursuant to ElWOG § 19, in the case of insufficient capacity for interconnections for supplies exceeding control areas, a preference of transport to supply customers with electricity from renewable energy sources and CHP plants on the part of implementation laws is established in order to comply with all applications to use systems. In this connection, however the obligation to comply with the conditions and guidelines in terms of cross-border exchanges in electricity must be taken into account.

h) Are any renewable installations ready to come online but not connected due to capacity limitations of the grid? If so, what steps are taken to resolve this and by when is it expected to be solved?

No.

i) Are the rules on cost sharing and bearing of network technical adaptations set up and published by transmission and distribution system operators? If so, where? How is it ensured that these rules are based on objective, transparent and nondiscriminatory criteria? Are there special rules for producers located in peripheral regions and regions with low population density?

Currently, both extractors and suppliers have to pay a grid access fee which must correspond directly with the costs involved in establishing the connection. Furthermore, extractors have to pay a grid activation fee. The proposed regulations concerning this matter are determined in the Systemnutzungstarife-Verordnung (E-Control, SNT-VO 2010).

Through the requirement of transparent and comprehensive evidence of necessary expenses as stipulated under SNT-VO, it should be ensured that the possibility is given to the grid user to check the estimated costs for the connection work concerning their suitability, for example by obtaining a quote from one of the companies authorized in this respect.

For producers in peripheral regions and in regions with low population density there are no special regulations.

j) Please describe how the costs of connection and technical adaptation are attributed to producers and/or transmission and/or distribution system operators? How are transmission and distribution system operators able to recover these investment costs? Is any modification of these cost-bearing rules planned in the future? What changes do you envisage and what results are expected?

The relevant regulations regarding grid connection and any technical adaptations are determined in the Systemnutzungstarife-Verordnung (SNT-VO 2010); it specifically refers to the grid access and grid activation fees.

As mentioned above, both extractors and suppliers currently have to pay a grid access fee which must correspond directly with the costs involved in establishing the connection. Furthermore,

extractors only have to pay a grid activation fee.

Under SNT-VO § 2 all reasonable prices at the usual market rate corresponding to expenses are compensated through the one-off grid access fee to be paid by the grid user, which are directly connected with the first-time establishment of a network connection or the alteration of an existing connection as a result of an increased connection load of a grid user.

A change in the cost allocation at the expense of the system operator is not currently contemplated.

k) Are there rules for sharing the costs between initially and subsequently connected producers? If not, how are the benefits for subsequently connected producers taken into account?

Thought has been given to an overall optimal grid expansion which ensures the expansion development of renewable energy sources over several years. Existing costs are not differentiated in terms of sharing them between the first and subsequently connected producers.

l) How will it be ensured that transmission and distribution system operators provide new producers wishing to be connected with the necessary information on costs, a precise timetable for processing their requests and an indicative timetable for their grid connection?

The system operator is obliged to present new producers with a quote for the connection of their installations to public grids which must be prepared on the principles of optimal cost effectiveness.

Electricity Network Operation based on Renewable Energy Directive 2009/28/EC, Article 16, Section 2 and Article 16, Sections 7 – 8, as outlined in Austria's National Renewable Energy Action Plan (2010)

a) How is the transmission and distribution of electricity from renewable energy sources guaranteed by transmission and distribution system operators? Is priority or guaranteed access ensured?

The grid expansion should ensure the appropriate distribution capacity in time.

For more information, see Section 4.2.6. As stated there, the extension schemes for wind and hydropower, which represents the largest extension schemes for renewable energies in the next ten years, has led to corresponding preparations by system operators.

Pursuant to ElWOG § 19, in the case of insufficient capacity for interconnections for supplies exceeding control areas, a preference of transport to supply customers with electricity from renewable energy sources and CHP plants on the part of implementation laws is established in order to comply with all applications to use systems. In this connection, however the obligation to comply with the conditions and guidelines in terms of cross-border exchanges in electricity must be taken into account.

b) How is it ensured that transmission system operators, when dispatching electricity generating installations give priority to those using renewable energy sources?

The grid expansion should ensure the appropriate distribution capacity in time.

c) How are grid- and market-related operational measures taken in order to minimize the curtailment of electricity from renewable energy sources? What kinds of measures are planned and when is implementation expected?

As mentioned above, grid expansion should ensure the appropriate distribution capacity in time.

Furthermore, as stated in Section 4.2.6, pursuant to ElWOG § 19, in the case of insufficient capacity for interconnections for supplies exceeding control areas, a preference of transport to supply customers with electricity from renewable energy sources and CHP plants on the part of implementation laws is established in order to comply with all applications to use systems. In this connection, however the obligation to comply with the conditions and guidelines in terms of cross-border exchanges in electricity must be taken into account.

d) Is the energy regulatory authority informed about these measures? Does it have the competence to monitor and enforce implementation of these measures?

The regulatory authority can draw on its right to information under the Energie-Regulierungsbehördengesetzes (Energy Regulatory Authorities Act, E-RBG, BGBl. I No 121/2000 BV BGBl. I Nr. 148/2002) § 27.

e) Are plants generating electricity from renewable energy sources integrated in the electricity market? Could you please describe how? What are their obligations regarding participation in the electricity market?

Plants which produce electricity from renewable energy sources and that are not supported are fully integrated in the energy market and market their product just as other electricity producers.

For plants which produce electricity from renewable energy sources and that are supported, a specified purchase obligation exists for supported tariffs because they cannot be operated through market solutions alone.

f) What are the rules for charging transmission and distribution tariffs to generators of electricity from renewable energy sources?

Producers of electricity from renewable energy sources are charged grid costs just as other producers of electric energy.

Appendix G

Phone Interview with Christoph Schuh
Strategic Corporate Projects
Austrian Power Grid AG

January 7, 2015

This interview is for my Master's work. I have been in Vienna since September. I am trying to understand the siting and decision making processes of wind farm development in Burgenland. I am working on interviews different stakeholders, like NGOs, government, and wind developers. The second part of my work is spatial analysis, and so I am making a map showing the different stakeholders and influences. I have tried looking for the locations of the substations and the transmission lines in Burgenland but that has been difficult to find. I know it may also be a security issue.

In Burgenland…I can just speak for the Austrian Power Grid which is the overlaying high voltage grid in Austria. We have one electric power transformation station in *Zurmdorf* where nearly 80 – 90% of the wind of Burgenland is integrated into our grid because the demand of electricity in Burgenland is quite not enough in comparison to the amount of the electricity which is produced in Burgenland. We have to put it [the generated wind energy] from Burgenland away into, for example, the high demanding areas of Austria like Vienna. Or, on the other hand, for storage reasons into the pumped storage plants in the Alps. That's the angle of our involvement in the wind topic in Burgenland. We are mainly the company which transports the electricity away from Burgenland.

And there is only the one substation in Burgenland for APG?

Yeah there is a very big one. It is in Zurndorf. There are smaller ones also. You can see it on our map at www.apg.at. There is also a master map in Master Plan 2030. You can see in a very detailed way our planning in Burgenland. There are upgrades, new building, new substations, transformation stations, whatever, in Burgenland and the whole Austrian area. This would be the literature where you can read it and where you can analyze it, where the developments are going on there.

Thank you for the suggestion. Within Burgenland, do you have any specific concerns regarding current or future wind development?

In Austria, we have the development which is going on where we will double our production of wind from, generally 800 – 900 MW. We will double it in the next two years. So we need to manage 4000 MW wind power, which is quite much in comparison, for example, the whole hydro-generation in the Danube River which is I think 2500 – 3000 MW. There is really a huge development going on. The APG is the manager of the overlay grid, the high voltage grid in Austria. It is mainly 380 kV and partly 220 kV. We have about 6500 km of lines in Austria. We are the only company, and we are authorized by law and responsible for balancing electricity

demand and the oversight. We have to make the decisions. If, for example, there is too much demand or too less offered we can go into the market and say, "We need more. Or we need less. Or we forbid someone to integrate." We are a monopoly. There is just one leader of this control area in Austria, and this is the APG. The huge necessity of the integration of new wind is coming up to us because the capacities, which are needed, are possible in our grid and not in the regional grids. For example, every Federal State has a regional grid company. In Burgenland it is Energie Burgenland. But the capacities of the regional grids, especially in Burgenland or Lower Austria, is not enough to integrate the produced wind into their grid. So they need to go directly…the wind energy in general, there are some areas which is regulated in a different way…In general, the wind power in Burgenland is going directly in the overlay grid and not in the regional grid.

And that is because the capacity of Energie Burgenland is insufficient.

The grid capacity in the regional grid is not large enough for the capacities needed. In Burgenland, I think we have 900 – 1000 MW of wind production. If you look at the regional grid, the capacities are not enough to manage it. There is a long process going on between the planning business units from Energie Burgenland and APG, where we always coordinate our investments and try to figure out what is the best technical solution for the demand that is going on. We have a forecast which is going 10 -15 years because of the investments which have to be done. For example, a substation has a value of €40 – €60 million, and not much less. You have to go to the regulator and have it permitted. There are some planning tools in Austria, which have to be done by law. It is the Network Development Plan, a yearly plan which is approved by the national regulator and there is a public consultation always in the summer. There are all investments of the APG in the grid, in the substations, etc. mentioned. We have a three year forecast, the Network Development Plan 2014. This plan is also readable online…you see the forecast for our investments for the next three years.

Thank you. I will look into that. In addition to that, are there any ongoing or future projects planned within Burgenland?

If you are going through the Network Development Plan and the Master Plan, you will see all our plans…you will find the exact numbers, facts, and figures…you can find it out on the project site. There are many facts and figures…I will send you a link to the Master Plan and the Network Development Plan. In addition to that, we have traditional planning cooperation with the local government and the local electricity grid company, like Energie Burgenland. Our technicians sit together and develop together which adoptions or upgrades are necessary because of, for example, new investments or new permitting in wind or in solar PV which are going on in the region. We know, for example, in the next 2 – 3 years, there will be an add on in Burgenland of 200 – 300 MW. In Lower Austria, it is about 1000 MW. These are the basic numbers which are common and generated by Energie Burgenland or Energie Lower Austria. Then we plan together and try to find out which is the best technical solution for the necessities.

I see. In a similar way, can you speak about the relationship that APG has with wind developers?

The wind developers, as I said before…We are, something like, the last step of the relationships from the wind developers to, let me say, the traditional electricity industry. They have to talk with regional electricity companies, like Energie Burgenland or whatever, to get the permitting of their wind park, for example, and also with the regional government. And if there is permitting already done by the regional electricity company and by the government, then we are faced with this problem or, let me say, of potential investments because of the capacities which are not ready at the regional level. And then we have to adopt our planning. We are in, let me say, general discussions with IG Windkraft, where also our technical planning business units and the IG Windkraft…there are permanent meetings every 3 – 4 months where we talk about regional development and regional potential decisions which have to be made. We have, let me say, informal meeting points, technical areas where we know each other. But the hard facts, the hard planning, have to be done and have to be made with the regional electricity company. But we have a very good relationship in general discussions and in general handing of the wind integration. Because, as I said, with the IG Windkraft, there is a really intensive outlook together.

Can you think of any good practices or any examples from working with Energie Burgenland?

As I said before, it was the development on the first side…we made a new line through Burgenland. It was opened in 2000. The so-called *Burgenland Lietung*. It is a 380 kV line is going through Burgenland since that time. This was also necessary because of the need of the capacities for the renewables. This was one of the projects which was supported by Energie Burgenland. On the other hand, there was one big project…the substation *Zurndorf*. You will find Zurndorf in our planning [Master Plan]. It is a substation from APG and Energie Burgenland. It is managed by us but there is also participation of Energie Burgenland. And where I think we are technically ready for 900 MW of wind integration into the substation. So, it is quite a lot of investments that were made in the last 5 – 7 years. This is, let me say, one of our really landmarks in cooperation with Energie Burgenland.

Is there any pushback or criticism of wind development from APG's perspective, or the other way around?

As far as we are concerned and as far as it is possible it is for me to give you feedback…I think in Burgenland, let me say, it is common sense for the wind energy or the wind electricity is something like a project of honor for Burgenland. And it was well prepared by the local government because their regional development plan, their regional permitting areas, which were reserved for the wind production. So it was well prepared. If you know Burgenland, it is on very flat and not used landscape. There are some areas, some really rough areas, around the Nuesidel See. But the Parndorfer Platte is an agricultural area. And let me say, in a funny way, if there are wind mills or if there are not wind mills, nobody happens…let me say, there is less room for criticism. I think these maps and this planning was well prepared. For the future, I think Burgenland is fed up. So maybe there are some development areas in upgrading the existing mills, on the one hand. On the other hand, there are some very special and small potential areas for new parks. But I think there are 5 – 10, so not very much. So I think they are coming at the end of potential development in the area. Maybe with upgrading, they can

heighten their capacities. But I think it is well prepared and it's also accepted by the local people. I think Burgenland is something like a good showcase, where you can see if the local government, if the federal government, and the main opinion leaders of an area develop projects together, then there is a big possibility to get them through.

I know that APG is a partner member in the TransWind project with BOKU. Can you speak to that experience? Have you been included in these stakeholder discussions?

It is a cooperation where we try to find out the technical outcomes or the technical needs of the development which is going on in the renewables. Therefore, we have many cooperations. On the one hand, with other TSOs in Europe. Then, we have cooperations with the Technical University in Graz-Stuer, for example. And, as you said, with BOKU. Because it is an area of future. Nobody knows in this scenario if the energy system in 2020 or 2025, in reality…possibilities are mentioned and possibilities are not mentioned. Nobody knows the price development. We try to get more valid facts and figures and more valid scenarios for our technical solutions. Therefore, this cooperation is, let me say, one part of many. It is our basic work that we have to do. We have to try to look in the future and find out which developments are possible and which developments are not possible. We have to make the decisions. We have to make the planning. We have to make the investments for these possible scenarios. Therefore, we have these cooperations.

Thank you. Is there any last point or any information that you think would be helpful for me to know?

From my point of view…I will send you the links of the Network Development Plan and our Master Plan. There you will find a lot of facts and figures which you can use for your Master's thesis. As I said before, we are the company which tries to handle the huge developments which are going on in this area and try to find out how to get the capacities into our grid. Until now, we could handle it. We try to handle it for the future. If you know the numbers…For example, in Germany and in other areas of Europe, the renewables are really something like the hard test for the existing grid. I think there will be some problems coming on in combination of closing the traditional plants, like thermal plants. In the whole system, all stakeholders will have to do hard work to get the system working on. That's the general message. It's not getting easier. It's getting more complicated. The questions are getting more and more. The external influences, like prices, CO_2 certificate prices, energy prices, foundations, whatever, it is an interesting time. This will not be a new sentence fore you…I just wanted to strengthen it…we are trying to handle all this to get the security of supply still going on, with or without wind.

Appendix G

Interview with Mag. Gábor Wichmann
Department of Nature Protection
BirdLife Austria

November 18, 2014

Birdlife is in someway directly affected by wind development in Austria and in Burgenland, my area of focus. I want to know your role as a stakeholder in that process.

We have different roles. On one side, we are a NGO and trying to stop some of the major projects that are harming the environment of birds. On the other perspective, we try to find solutions and make zoning studies and so on, in Burgenland, Lower Austria, and Upper Austria. We are a little bit of a mixed position. In the environmental assessments, we were advocates for the wind power plant companies. On the other side, we were trying to find solutions with the companies as well as with the inhabitants, because they get a lot of money for small villages. They need this money.

You are in-between different roles?

Yes, for sure. NGO is a major role for us but we are trying to find some compromises.

In what ways have you been involved in site selection or impact assessment?

More in site selection than impact assessment. Impact assessment in Austria is at the moment being very poorly studied. That is what we are trying to push, that there will be more studies on impact assessments. Mostly, we get the literature from Germany about some special species or companies. By the end of the next year [2015], the subsides will stop for wind energy. They will have to plan and get through the whole process, the environmental assessment, and they will have to finish this by Autumn of next year. Now, there is a little bit of a possibility for us to push or start some evaluations or impact assessments of wind power plants concerning the birds.

It is coming up?

Hopefully, yeah. It is always like if you have a project, and they know that this project has a problem with a certain bird species, then they are doing this. If, this connection isn't there, then it is hard to get any evaluation. They do now want to invest money without knowing how the investment will come back.

I saw online you have the international 2005 position statement on wind farms. Has anything changed since 2005? Is there a new position?

Yes. I don't think the position itself has changed but I think the details have changed. We know a little bit more about the impacts and so on. I think this is what has changed. I think that the aspect of accumulation is getting more and more severe because, for Austria, we have about

1000 wind power plants [turbines] and 300 - 400 more next year. So 1500 in the next few years, with most of them in Lower Austria and Burgenland. In Germany, there are thousands of wind power [turbines], and in Spain too. That accumulation of wind power plants will be a big aspect, which is very hard to study.

Is there a position for Lower Austria or Burgenland? I ask because I saw something from the WWF related to wind development in Burgenland.

Yes, but to my honest, it was ten years too late. The first study was done in 2002, and by then most of the areas are full of wind farms. It was a nice exercise, but for sure too late. There is a new international position statement from BirdLife. I will send you that.

I want to inquire generally about specific species of birds that have been affected across Austria or specifically within Burgenland. Where is the damage taken place?

In eastern Austria, the Imperial Eagle, White-Tailed Eagle, Red Kite, Saker Falcon are the bigger species in these areas. Then, there are really important roosting places and places of migration. In the alpine areas, more or less, there are some special species and there, I think, migration may be a bigger issue because the altitude is very high and the topography. We are working on that now with a big study, with radar, and so on, to get inside the migration in the alpine areas. VIA is the biggest study ever in Austria. The study is not finished. It will be finished in the summer.

As wind farms come online, are there are any best practices, planning, or technical changes that can help promote birds, migration routes, and habitats?

I think that the designation in Lower Austria and Burgenland is quite good because we did it...we were integrated to the planning. But, for example, for Lower Austria, it was too late. We did it last year [2013] and they started with the permits and development was 4 - 5 years ago. It was quite too late because they were only had just some areas to go for wind power, because you have to be 1.2 km from the villages. You have to be more and more pressed into areas by people. It was too late and the political process was not that good. In Burgenland, it was a little bit better because they did all of the designations or permitting before there was a big boom in wind power.

Was there a special type of zoning?

No. Zoning was, first of all, we selected the species which were important in the area and affected by wind power plants, so we got some sort of priority list. From this priority list, we were able to zone it as the most important areas for these species. We tried to get an idea where the areas do not want wind power plant. Another way was to just look at the most important roosting places to do the zoning, some kind of migration routes, or some exchange between two important roosting places. That's was how we did the zoning. We also did the zoning for the landscape. That was another part, and tried to get it into one map and then try to find compromises. There were small places, as I said. For birds, it would be bad to put the power plants here and more landscape it makes no difference. Or the other way around.

When you say landscape, what do you mean?

The view. I think that is the most important thing in alpine areas. People do not want the wind power plants in their boundary.

Generally, how are the roosting areas and migration routes identified? Observation? Being in the field?

Yes, and we have a lot of data that we collect and put together. We collect [data] with other ornithologists and a lot of studies, and try make this data useful. The roosting places are quite well known. The problem is to find the migration routes. That is something that we do not know. For example, water fowls are migrating where there are streams. That is quite clear. For geese or eagles, are there special routes or do they fly everywhere?

What about satellites?

Yes, that is something we started last year with Imperial Eagles. But in Austria, concerning the science, especially ornithology, is not that developed. Even as an international organization, its helpful. But some species, like the Imperial Eagle, are eastern species and they are at the western end of their distribution in Austria. There is no real study or experience with these species in the western countries. That is why it can be a little bit different. This is the Imperial Eagle and Saker Falcon. Both of them are worldwide endangered, so it is really important to protect in Austria.

Thinking about balancing between the environmental and society, is there a certain perspective that BirdLife has on to balance these things together to harmoniously develop?

Hopefully yes, because for a NGO like us, where we have a lot of ornithologists working for BirdLife or just interested in bird species, it is even harder to balance inside our organization. Most people don't want wind power plants because they can kill birds, change the distribution of birds. They have a lot of effects on birds. But, I think that other alternative energy, like biomass and so, are affecting the birds more than wind power plants. That is why it is very hard for our organization. Especially in alpine areas, our members are very against wind energy. It's hard to balance within our organization. The next problem to balance with is with the companies. They are just looking for two - three years. A normal company is not looking at the business that have in ten or fifteen years. They have another type of timescale. Our timescale is wider.

With the wind farms, some can last ten - twenty years. That is factor for them too, right?

Yeah, sure. But if they have the possibility of building wind power plants and getting the subsidies, they will have no problems economically. It [wind subsidies] is changing a little bit but it is sure they are just going building wherever they can.

So as subsidies end, perhaps there will be more thought given to where development can

take place?

For them, the crucial point is where can I build wind power plants in one or two years at this or that site. If they build it, they have no problem because they get the money. It is a very good investment because they can get the money for ten or twenty years. It is clear where the break even point is, whether at this site in twelve years or that site in fifteen years. It can change with one or two years, but the crucial point is, "Can I build it on this site?" At that is something they are only looking at one, two, or three years in planning. For example, subsidies will end in 2015, and all they are thinking about is they can build a lot of wind power plants by the end of 2015. That is all they are thinking. It is hard, and there is the point where we can get it and say, "If you want to build on this critical site, we want to have a relationship, have this, have that." We can put the pressure on them. There is the problem of balancing between that which we at the center are thinking. Even if they are building it on critical sites, we can have another kind of value for us. Better studies, better look about impacts, and so on. But our members, some of them are not accepting the fact. For them, it is more important that the critical sites aren't built with wind power. That is a balance with members and what they are thinking, the companies, and the villages as well. They get the subsidies. It's a lot of money. I think it can be $5,000 EUR per year for every one turbine. It is hard for them to say, "If we put it somewhere else, it would be better for the birds but it would be outside of our border and so we wont' get any [money]."

There are inherent conflicts everywhere. It is a political issue.

Yes. And the results of the studies aren't black and white. They are grey. In nature, a lot of things are grey and not like black and white.

Has there been any support or consideration for BirdLife from political organizations at state or federal government?

It's different in all the Bundesland. In Burgenland, it was from [Hans] Niessl himself, the head of the federal state. "I want to increase the amount of wind power going up because we haven't got anything else to produce energy." So that is why it was, more or less, a high level for a federal state. And it was clear that they would involve us. We met Niessl and it was clear that we were working under this framework. It was clear that if we just get this result of the study together with landscape and so on, then they will accept it. In Lower Austria, it was the same but ten years late. We first met them in 2003, and they wanted to results, but the study was never published. Some years later, they realized that they would get more and more problems to build this power plant because a lot of inhabitants did not want the wind power plants close to their villages. We did a lot of work against some of the sites, and so on, and so there was pressure from our side to involve BirdLife, otherwise the government will get more and more problems. That was the other way around. It was more like putting big lobby pressure on it, and then they involved us. The Umweltanwelt (State Environmental Advocacy) is an official federal institution that works for the environment and conservation, but is also involved in political processes and works a little bit like a NGO.

They act as a sort of balance?

Yes. Every year, they get a certain amount of funding. But like a NGO, each year is different. With these funds, they can try to be like a balance of environmental stuff. It is between a NGO and federal governmental organization. For example, in Upper Austria, they are bit more strict and hard and act like a NGO. For them, we made this zoning study. And then the government said, "If working with the zoning study, we can use it." If we hadn't done this, it would be completely different in Upper Austria.

Appendix G

Interview with Michael Sorger
Department of Green Electricity and Energy Efficiency
E-Control for the Regulation of Electricity and Gas Industry (E-Control)

November 17, 2014

I am becoming more familiar with the Austrian support-system for renewable energy. Can you provide a brief overview?

The Austrian support system is the main driver...We have the renewable energy law, and there it states that a certain amount of money must be spent on all different kinds of energy except for big hydropower...Depending on the source, the feed-in tarrifs are for either 13 or 15 years...For wind, the tariff is now 9.36 and will go down by 1% in 2015...Normally, there is a new decree issued by the Ministry of Economics or the law states that it decreases by 1%. It depends if they want to issue a new rate or not.

There is one central identity, the green electricity company (licensed) which handles the money and the contracts. You apply as a green electricity producer for the feed-in-tariff, and there is a certain amount of money that is distributed each year. Then, the producer gives all of its electricity directly, you sell it more or less, to the green electricity company, and you get all the money from this company. And this central company distributes to all electricity traders in Austria. So if you want to supply electricity to final customer in Austria, you have to take a certain share of this supported renewables. You are obliged to take this and you can distribute it to the final end customer. For the end customer, there is a certain charge on network loss. The green electricity surcharge is a network tariff and there is a flat-rate for each metering point. That is how the system is funded.

How many licensed green electricity companies are there?

Just one, OeMAG, licensed by the law and the Ministry of Economics.

Are there different balancing groups?

There are in general, but there is one balancing group for this green electricity company [OeMAG]. They have their own balancing group...and they are distributing this electricity to customers.

This is how wind is Austria, generally, is supported. And that's how it is built in the end.

As we look at this period of 13 - 15 years where costs have increased, has there been pushback against renewables because of that or do people generally accept that this is just what needs to happen right now?

It's controversial still because some feed-in-tariffs have increased, and goal is to get the technologies into the market. If the feed-in-tariffs increase, you get away from the market. And the market-price itself decreased pretty steep actually. Now we are 3.4 cents/kWh, and in 2008 it was around 8 cents/kWh. That is a thing you can influence in Austria, and that is because it is mainly driven because of Germany. They influence the market price and in Austria, since we have always have had a cap on how much additional money we spent, the system is not that expensive compared to Germany. People say it is still okay, but it is probably not the most efficient way our money is spent because you have a fixed feed-in-tariff for a certain amount of time and money. Electricity is done through two separate markets. You have the supported electricity, which doesn't react to every market size. Even in if the market price will be negative, they would still want to feed or put as much energy into the grid as possible because they get paid for electricity delivered to the grid. In the next system, there will be a change, or I'm pretty sure because of the guidelines of the union. Then, you have to take care that those producers also are subject to signs from the market and to respond to it if it is possible.

Does E-Control or other regulations in place say that for an intermittent source of renewable energy, like solar or wind, is there a push to get them to move towards storage, to incorporate something that would mitigate the market being flooded?

Not really directly. For PV, it is going to get more and more interesting for smaller installations because you will have a big difference between what final customers are paying (around 20 cent/kWh, all surcharges included), but you probably can produce at less than 10 cents/kWh if you have PV. You have a spread of 10 cents, and that is still too much for storage. But, storage is getting cheaper and if the gap is high enough between what you pay and what you just need and what you produced yourself, it is getting interesting more and more. For wind, the bigger thing will be in the future is that they just don't feed-in into the grid if the market price is below zero, for example. There is no incentive, when there are negative market prices and renewables still produce energy. They have a certain responsibility to deliver what they promised. There is a forecast but it doesn't matter for them what the forecast would have been, to just produce or not. There is no incentive for them to do anything else...We have a lot of wind and it is pretty hard to do a good forecast and use that forecast in a system like what we have now. In the future, it is going to be harder to get it closer to what is estimated…If you are above or below, short or long, it doesn't really matter at the moment because now you pay anyway. If you are short or long in your forecast, you have to pay for energy.

How does the challenge to balance adequately influence the development of new grid infrastructure? Does it change where transmission lines are located? Is there any push to modernize based on balancing adequately.

I think for Austria, [balancing new energy sources] is not such a big deal, actually. We have the grid development plans, and every area is required to have a ten-year network development plan. In Austria, we are trying to work on the biggest transmission lines. I think there are some gaps in Salzburg, and the Ringschluss (grid extension as a 380 KV ring)...that is the major thing that is planned and is going to be built. For the distribution lines…as far as I know, in Burgenland, they have to build a couple of new lines. Those are especially for wind, but it is not

a real issue.

It is independent of the need for balancing?

Yes, because they know they are going to have more wind farms there, they need the grid. It is not because of balancing. They simply just need the capacity. We have a lot of hydro-storage that we could use, but it is just the market being coupled together with Germany so there is no progress on the price difference between formal base and peak. The difference between the lowest and the highest price, between short amount of times, it's not that big anymore. You don't get that much more money out of the system any more by having pumped storage. More or less, you use it for balancing more than before. But still, it looks like the incentive isn't that big that it needs to be immediately built. It's just a question of price.

As is, you are going to be hitting your national and EU targets. So which energy source is used is really just based on price?

First, we are just talking about electricity here, because heat is something different. We have about 70% covered by hydropower itself. The supported amount was 12.5% in 2013. We are above 80% electricity from renewables already. There is only a small share that isn't from renewables. It is going to be more. We can probably get to 20% from supported renewables, and then we are up to 90%. If it is a good [hydropower] year, we can probably get to 95% electricity from renewables.

I saw that Burgenland has committed to 100% renewables-based electricity.

Yes. The thing is that they calculated this over a year. They have a lot of wind power, but it's on throughout the whole year. They just calculate how much they produce through the whole year and say, "Okay, we have 100% renewable electricity." That is not true because what they have is just distributed through the whole grid, Europe, or wherever it goes. And then if they need more power, they just get it from the grid. It's not the same. They are not on target by themselves.

It is a projection of their self-sufficiency?

Yes. For them, they have good sites for wind energy, that's clear. And the Austrian system doesn't distinguish between the sites. So you see, all of the companies try to build there because it is more efficient for them. They get the same feed-in tariff, but they have more full-load hours compared to somewhere else in Austria. They get much more money out of it.

I am interested in the strengths and weaknesses of wind development, and the ability to meet E-Control objectives. You've mentioned it a bit but maybe you can discuss some more. What are these opportunities and challenges for wind in Austria? You have a decreasing feed-in tariff. Are there other incentives or structures in place?

Not really. Not now. It depends what the future will bring. The guidelines say there won't be any fixed feed-in tariffs in the future for new installations. It's going to be crucial for new wind parks and all other new installations to develop a new way how to market electricity in the

future. Now, they don't market it. They just sell it to OeMAG. It's going to be crucial, I guess, because there is going to be a premium on top of the market price. They have to get better at how to market it. If they use it for balancing energy and the balancing energy market, or whatever, this is also going to be a big opportunity for new installations. If they are flexible or whatever they can do to fit more or fit better into the whole electricity market as it is. Now, it is just a separate part. For all the installations, there are some that are above those 13 years. They already could market their electricity in the market, but they still sell it to OeMAG for the regular market price. It's pretty low, about 3.4 cents/kWh. But they still sell it to OeMAG instead of marketing the electricity themselves. To build up knowhow there is going to be crucial.

Between 10 and 20 years from now, its going to look completely different?

The support system for sure. I don't really know what is going to happen to the old wind installations. I'm pretty sure that a lot of them...well, it depends. If a lot of sites are going to get repowered, then they get the new feed-in tariff again. Or, if they run for more than 13 years, they may say, "We have had the feed-in tariff for 13 years, and now I can produce for close to zero [cost]." 1-2 cent/kWh is the running costs for a plant. We will see if they keep running or if they repower those plants.

What do you mean by repower?

Repowering - to tear down [wind farms] and build new ones, and get the new feed-in tariff again for 13 years. That might be an option. Those plants can run for more than 13 years, more like 20 or 25 years. That is not the problem. After 13 years, they don't get the feed-in tariff anymore. It is quite a possibility to tear it down, rebuild a new one, and get the feed-in tariff again. They can produce the electricity for close to 1-2 cent/kWh, and they only get 3.4 cent/kWh. It is not too much. If they decide to send it OeMAG and don't market it on the balancing market where they would get more, that depends on the companies. The feed-in tariff would be probably still be above 9 cent/kWh, and they get it for 13 years fixed. They crunch the numbers. Build it or not. Repower it or not. I guess the financing wouldn't be a problem because all of the banks are happy to loan the money. They know for 13 years you have fixed income for this plant. There is a lot of money in the market. It is a pretty safe bet in Austria to build a wind farm. If you have to site, financing won't be a problem.

Are there any other influences for siting wind, from the perspective of E-Control?

I think, compared to five years ago, it is getting a little bit more difficult and people have the NIMBY thing going on more and more. There probably will be some sites where people say that they don't want anything there. In Lower Austria, they have excluded a lot of sites with good potential. They said, "You can't build there." This is going to be an issue more and more.

Maybe new zoning will be influential?

Yes, that is probably going to be the biggest issue. It is influencing. It is going to go back and forth. If there are less and less [available] cells, probably the feed-in tariff is going to rise again because the zones are influencing a higher feed-in tariff. I guess, this is how...I don't see that

there won't be any new wind farms anymore. It is probably going to be less, but still there will be development. It is still one of the cheaper technologies to finance.

And the technology costs will get lower too?

Hopefully, but they [IG Windkraft] said the costs for wind farms won't get lower. They [IG Windkraft] said the cost for new wind parks will get higher because they have to do more. We'll see. I'm not pretty sure about that.

But technology will change, so...

Yes, and that is what we always say. They [IG Windkraft] agree and say that technology is changing to some degree, but they have to then do more things that are more expensive. You have to build this and do that, and so on.

Similarly, are there any implications for siting of transmission lines, from the perspective of E-Control?

Not really. Since we have one feed-in tariff for all of Austria, you somehow implicate that the ones who want to build the plant, they are looking for the cheapest site they can get overall. If the grid isn't there, they have to pay for it, to some degree. It regulates itself automatically, to some degree. In Burgenland and Lower Austria, the sites are better regarding the full-load hours for wind. And then you still have to take a look at the grid. It is a money-game. The grid itself in Austria is, from my point of view, pretty good. It's not influenced by a wind farm here or there. It's not like it isn't possible from the grid. If it wouldn't be possible, then the network or distribution company they would just say that it is not possible to build a wind farm right here. They can look if they have to build new lines over the next 10 - 15 years, but they won't build a special line for a wind park at their own cost. It wouldn't be financed by the tariffs. The wind farm would have to pay for it. Even a big wind farm probably won't be built if they [the network or distribution company] have to build a new line [independently].

Because of where wind power is located in Austria (mostly in the east, next to many borders), is there any worry or chance of energy being built there but sent out elsewhere? Is there a clause in any regulation that says, 'The majority of energy that is produced here has to be sent or used here.'?

Not really. In a physical way of speaking, you can't really control where it is going. But, we have permitting, guarantees of origin. Theoretically speaking, all of the supported electricity is used somehow in Austria through those guarantees of origin. All of this [supported] electricity is sold to the electricity traders, and they use it for the final customers. It is not a real issue. As far I know, there haven't been any special problems at borders, even if there is higher wind days or higher PVs. For Germany, they have problems because they push a lot of electricity via Poland and Czech Republic. When wind is blowing, they have too much wind electricity. It is still not a problem for them because to reach EU targets, it is just electricity produced. Where it is going from there [electricity generation] is not an issue. It is just that, for those bordering countries, it depends if they can stabilize their own grid. I think Poland has problems from time-to-time to

keep their grid stable, because all the wind from Germany is being pushed in there. For Austria and neighboring countries, it is still low. We have had 5.2% of final consumption from wind power in 2013. It is looking pretty good. I guess it depends on how the grid in your country looks and is established. There is enough capacity to get the wind from the eastern part to where it is needed in Austria. The load centers are pretty close. You don't have big distances where you have to transport the electricity. In Germany, it is a big problem to get it from the north to the south, and so they most often go east. There isn't enough [grid]capacity, so [generated]wind takes the path of least resistance. It goes to Poland and then back to Germany in the south.

Like you said, it's a money-game and efficiency is huge.

It is pretty difficult to build new lines, as it takes a lot of time to get the permits. The Germans know they are supposed to build a couple of big lines, but it is pretty hard to get the permits. That is also a NIMBY problem, because people don't really want the wind power in their backyard but they don't want the lines either. Either you have production close to yourself or you have electrical lines.

Usually, there is a small payment for rental of that area granted to the land owner.

It depends. You could use it for wind itself. You can have participation of the people living there. That is a way to get more built. There can be a partnership with the wind plant, and so it becomes more likely. And there is rent for the power lines, of course. But still, people can oppose it. 'It is not my ground, but I am living close to it and I don't want the lines.' They protest against it. It depends.

Do you have any recommendations for me? Groups to target?

IG Windkraft.

From a general point, the biggest driver in Austria is the support system itself, depending on how high the feed-in tariff is. The money is limited. Every year, all the money is spent. The feed-in tariff could be lower and still all the money would be taken, and so more could have been financed. In the near future, they have to think more about what they do after 13 years for new installments. How they can make the most use of the electricity produced after 13 years? The first 13 years are straightforward. Just build it and keep it online as long as possible, or the most hours of the year. Afterwards, you have to think about what to do and how to sell your electricity in the market. There, probably one could look at different kind of marketing systems, or how companies in Germany do it. They sell it directly to the market. To make use of these kinds of system in Austria...

After 13 years, it still goes through the balancing group. There is still no uncertainty. "I'm selling my electricity to you, and I don't have to do anything else." Otherwise, you have to place your product, bid in the balancing market, or sell it at the exchange. You have to have a four-year long trading floor to trade electricity, if you don't sell it to OeMAG. You need a certain amount of plants. I heard once that you need a least 100 MW to market profitability. If you only have 5 MW, if you only have two wind plants, it doesn't make sense to sell it on the

market. You need a certain amount of installed capacity to market it and make money. If you need a trading floor, you have to people there. You don't have to do it yourself. You could have other companies do it for you.

For now, at least they have a guarantee where they could build up their capacities.

There is a German company that is trying to pool renewables together. It is getting more and more interesting because the market price is that low, that those companies are looking at other options now. In the past, they weren't looking at options because the market price was still high enough. They made enough revenue and said whatever. I don't need the risk of selling it directly to the market. I can just sell it directly to OeMAG and avoid any risk. The revenues looked like they were high enough, but now the revenues are getting down because the market price is pretty low. Now, they have to rethink. They will probably sell it to other companies.

At the end of November, we will publish a new report and I can send it to you. It is German but the graphs and tables are pretty straightforward.

Appendix G

Interview with Viola Schubaschitz and Michael Haider
Management and Development
Energie Burgenland Windkraft GmbH

December 1, 2014

Michael: The pace of turbines is growing. At this time, I think we have 211 turbines. We are the biggest producer of wind energy in Austria, Energie Burgenland Windkraft. We have the biggest wind farm in Austria, Andau with 79 turbines with 3 MW per turbine. That means 237 MW. This is the third biggest wind farm in Europe and the largest in Austria.

Can you provide a brief overview of the steps involved in establishing a wind farm in Burgenland (ex. certificates needed, wind measurement, permits, the environmental conditions that must be fulfilled, etc.)?

Michael: First, before you build a wind farm you have to take a wind measurement for 1 or 1.5 years. You need the middle wind speed for the year to see if you build a wind farm in this place. If the middle wind speed is not high enough, then you shouldn't build there because you won't get enough profit. The first step is the wind measurement. If you have the wind measurement, you have to go to the government and they give you some places where you can build wind turbines. They say, "This place is not good for wind turbines because there is a UNESCO world heritage site. Building wind farms is not allowed because you can see it from far distances," for example. Another way [of finding a non-suitable site] is from the World Wildlife Foundation (WWF), so you cannot put a wind farm in a national park. There are many places where you cannot build wind farms. The smaller places where you can build wind farms you get from the government of Burgenland. Then, you have this place, and you have your wind measurement, and…

Viola: In Austria, in each region, it is another government's decision how to build a wind farm. In Burgenland, the government said in **2001** that we make a regional framework so that we know the exclusion zones, where you are allowed to build wind farms or where it is absolutely forbidden like Natura 2000 or national parks. It's all in the presentation.

Presentation of Energie Burgenland: Historical Overview Burgenland

Viola: The first point is a historical review of Burgenland and Energie Windkraft Burgenland. We started in 1997 with our first wind farm in the community Zurndorf with six wind turbines, with about 500 kW of power per turbine. In 2001, we extended the number of wind turbines to 13. In Burgenland we have the so-called Wind Expansion Stages 1 and 2. These are our main projects. Expansion Stage 1 is about 200 turbines. In Expansion Stage 2, we grew the nominal power because we changed from 1.8 MW to 3 MW per turbine.

When you moved from 1.8 MW to 3 MW wind turbines, are the 3 MW turbines constructed in new areas or repowered?

Michael: Just new areas. No upgrades. The 1.8 MW turbines are still working in our wind farms.

Viola: All of Zurndorf repowered.

Michael: We removed the 13 turbines and we built there 3 turbines. With the 13 turbines, we had 5.6 MW. With the three turbines, we have 6 MW. We have three turbines with more nominal power than thirteen turbines. This is called repowering.

Generally, how long is the life span on these turbines?

Michael: The guarantee of a turbine is 20 years from the construction.

Viola: It will last longer but the constructor said about 20 years.

Michael: 20 years is guaranteed lifetime.

Viola: They also make the full-service package for 15 – 20 years, not longer.

I don't know if you lease or own the land, but is that also for about 20 years too?

Viola: We lease the land. It depends on the contract. Most of the time we have 25 years. There are also companies on the market that have 50 years also. It depends on who made the contract. Normally, we say the wind turbine is [in operation] for 20 – 25 years. You also have the feed-in tariff for 13 years at the moment. We don't know how long the wind turbine exactly stands. We also make the contract for the land lease. We also have a contract with the government so that every land receives the same amount of money. But in Lower Austria, you have complete other construction that is free-market. I give you 10,000 or 30,000. It depends on the region where you build the wind farm in Austria.

In Burgenland, the lease is a bit more controlled?

Viola: Yes. The paved area [the turbine foundation] is fixed and the farm owner cannot use it. Here, you get 1.12 €/m^2.

Michael: And the diameter of rotor blades is the wind-swept area. For this first wind-swept area, you get 0.37 €/m^2. For the double wind-swept area [twice the diameter], you get 0.12 €/m^2…The payment is annual.

Viola: We provide the maintenance year-round and they get the money because they give us their ground and can't use it. Most areas are from farmers. They can't use it and therefore get the money.

For leasing, it's per turbine basis.

Viola: When the turbine is on two properties and the turbine is on the wind-swept area…

Michael: Two or three farmers get money for the same turbine. The properties in Burgenland are often very small. You have many properties for the whole farm.

Viola: When you have a big farm, you can have 200 landowners or more.

Michael: Yeah, 200 landowners. 500 – 600 for a wind farm with 25 turbines.

Presentation of Energie Burgenland: Energie Burgenland Windkraft GmbH Historical Overview

Viola: We have an overview of Energie Burgenland Windkraft. The milestones. The first wind farm was built by our company in 1997. In 2003, there was the first Green Electricity Act (GEA). This was the main step for the expansion of wind farms in Burgenland and Lower Austria. The first feed-in tariff was 7.8 €¢/kWh. With this feed-in tariff, everyone said, "Yeah, that's great. We also want to build a wind farm." In 2006, there was the next amendment of the GEA and the feed-in tariff was about 6.7 €¢/kWh. With this feed-in tariff, it was too low for building the wind farms because you also have a high risk for building wind farms, enormous costs at the beginning and for researching. So most [companies] said, "No. At this feed-in tariff, we don't want to further build wind farms. In 2009, there was an amendment to the GEA and there was about 9.7 €¢/kWh. This is a feed-in tariff that shrinks with every MW installed. Now we are at 9.27 €¢/kWh for 13 years. At the beginning it was 11 years. For each kWh you get the fixed feed in tariff from the government. In the future, we don't really know because the feed-in tariff from the GEA ends in 2016. We don't know what will come afterwards. They can say there is no longer a feed-in tariff, higher, lower, or whatever.

Does Energie Burgenland Windkraft GmbH have a position on that?

Viola: For every wind company, we have the same right: first come, first served. There is 1000 MW and when that is established, the feed-in tariff is over. Then, they can make a new act or say it is over.

After the 1000 MW, do you think it's necessary to have another act? Is there a position held by the company?

Viola: It's always a question because the European Union wants to increase it. We have targets to reach, including Austria…The question is what to establish instead of wind power... we have a lot of hydropower in Austria. We can extend hydropower but the problem is the national parks and the government says no further hydropower. The Austrian electricity companies. Big tidal power plants in Germany because there it is easier to establish new ones. In Austria, you don't have much opportunities. You have wind farms in the north and east, a big amount of hydropower, and a small amount of photovoltaic solar energy, and a small amount of biomass/biogas…It's the only opportunity for Austria, hydropower plants and wind power. [Wind] is now about 6% – 7% of the whole production in Austria, and they want to increase it to

10%. We hope we will have a good amendment to the GEA. We have to wait.

Viola: We also have the two most powerful wind turbines in the world, the Enercon 126 from a German producer. We have them in Potzneusiedl because you have really strong wind situation about 20 km from the sea in North Germany. You have really strong conditions there. So we said we would make a test of the turbines. It works out very well. Better than we calculated.

Viola: The main step for Burgenland was last September when we, the government, had a big party. We became calculational self-sufficient. Calculational is very important because most people forget that we can produce the same amount every time.

Michael: We don't conserve the energy or use storage.

Viola: We are not a nuclear power plant, and they produce the same amount of power every time. Our production depends on the wind situation. In summer it is lower and in winter it is higher.

Does this mean that the wind energy that was produced here was more than that was used here over the course of the year?

Viola: Yes. You also have a graphic in the presentation.

The energy that is produced in Burgenland, is only used in Burgenland? You have to send it elsewhere with the grid.

Viola: You have the Austrian Power Grid, a daughter company of Verbund. We feed into the Austrian Power Grid, and they say we need power in Tyrol or we have to give to Hungary, Germany, Italy, etc.

Okay, calculational.

Michael: Yes, Andau. It's the biggest wind farm in Austria and the third biggest wind farm in Europe.

Is that by the number of turbines or the total nominal power?

Viola: The total nominal power is 237 MW from 79 turbines.

Presentation of Energie Burgenland: Renewable Energy and the Status Quo

Viola: There you see the whole amount of Burgenland and our part in it. At the moment, 387 wind turbines with 925 MW of nominal power, along with the maximum annual output for production, annual tons of CO2 reduction, and the household equivalent of CO2…

Viola: This is the installed power and method of generation in Burgenland. Biomass 3%, biogas 1%, wind 92%, and a small amount of other generation methods like solar, combined heat and

power, and small hydropower. In Austria, the biggest is hydropower and the rest is wind.

Viola: Here we have the latest establishments [with state of the art 3 MW turbines]. Mönchhof/Halbturn with 69 turbines and Andau with 79 turbines. These are the two biggest wind farms in Burgenland, and Andau is the third biggest onshore in Europe.

Basically, these two examples are why I am interested in studying wind farm development in Burgenland.

Michael: Yeah, it's a small area. In Germany, you have 50,000 turbines but you don't see them like you do in Burgenland. So many turbines on such a small area like in Burgenland. In Germany, you have a wind farm with 20 turbines and then the next wind farm is about 50 km so you can't see from one farm to the next farm. In Burgenland, you have one wind farm after the next. And so you have 200 turbines in one small area.

Viola: We only want to establish wind farms where they really work well. In the rest of Austria, you don't have this situation. It can't be profitable…I can also send you an overview card of where our wind farms are located. This map is from Getzankt and you can see where the wind moves really well.

Michael: In the north of Burgenland and Lower Austria is the best place for wind turbines.

Viola: And maybe you have a few points in Upper Austria but there you can only build hydropower.

And in the mountainous region, it is possible but more difficult.

Viola: Yes, and also much more expensive. You have much more service costs.

Michael: The service costs are very expensive. Becuase you are on a mountain, the turbine stops often because of problems with ice on the blades. They don't produce all year. In the wintertime, they stand still.

Viola: And also the transportation is very complicated. Sometimes you have to bring it up with a helicopter because you can't drive there because of snow. When the streets are too small, the radius is hard. You have to bring equipment up in many pieces.

Viola: Here we have the production and consumption levels of the years…2014 is just a forecast. We started in Burgenland with our own production in 1985. This was only a very very small hydropower plant. The real beginning was in 1997 with the first wind farm. After the pilot project was running well and we started to establish more and more wind farms, the production really starts to rise.

I was thinking it is good to know the production and consumption levels but it's also good to note that the energy that is produced here is sent elsewhere, as we are saying. But it still shows in some way that you are self-sufficient.

Viola: It is only to show it to the people because the government wants to say we are self-sufficient. And there we have our figures and they can use it for the press. In Austria, as I said before, we really can't use our produced energy. We can't use storage. APG decides where it goes.

Michael: Storage is currently too expensive.

Viola: As long as we don't have cheap and really good working batteries, you have to use it is needed.

Michael: You can use it with pumped storage hydropower station. With the hydropower plants in the mountains, you pump up the water wind the wind current you produce. In the summer time we don't have much wind but we have much water in the mountains. You can let the water down through the hydropower plants, and then you have a 'green' current of energy.

But that is not possible in Burgenland and battery storage is just too costly.

Viola: I'm not sure how long it is away. I think a few years or 20 years. It would be very helpful for wind energy

Michael: You can see it in electric vehicle production. 1 or 2 years ago you could drive with 150 km with electricity and then you have to charge the battery. Now, the new batteries from Audi or Volkswagen, you can drive 400 or 450 km in one charge. The batteries are getting better. They need a big area for the batteries.

Viola: The costs are too high.

It's cheaper to build more wind farms.

Viola: Batteries would be a very big difference. Now we have to concentrate on the grid. We can only feed in what the grid takes. When you have a battery, we can produce a lot of wind and build more wind farms because we can store it in the batteries and use it when we need it. But now, we have to wait for the grid to say that we can feed in all our power or you have to reduce the power [output] of the wind turbines. When the grid is fully loaded, they say 'Stop.'

Michael: Now, the new situation is you have much wind in Austria. When there is wind, you have to cut down the power of the [other] power plants. Hydropower must be shut down or the fossil fuel power plants must be shut down because wind can produce at 100%. You have to pay for power plants, gas or fossil or hydropower, when you say there is wind but the wind is not coming. You don't have current to put into the grid so you have to pay the energy from the power plants.

If you forecast wrong…

If my forecast is wrong, you [Energie Burgenland] have to pay. This is very difficult for us.

You don't get money for the current; you pay for the current. This is a new situation for Austria. The Austrian Power Grid has to regulate the grid, where the current is coming from and where does it have to go.

Presentation of Energie Burgenland: Main Steps of Building Wind Farms

Viola: The main steps as mentioned before, we have the regional framework from the government. This includes identification of suitability zones and exclusion zones. It's much easier for us because we don't have to look at every area, because we know this zone could be suitable for us or this is absolutely forbidden. It's much easier for the establishment of the project team.

The regional framework is a spatial planning guideline that says yes or no.

Viola: Yes. This [map] is north Burgenland. The government says that some areas are totally forbidden because of Natura 2000 sites and national parks

Michael: And UNESCO World Heritage sites.

Viola: You also have to have a distance to the communities.

Michael: Now its 1,200 m from the last property of the community, where it's possible to build a house.

What about when you have farm with several independent homes, not villages?

Viola: We don't really have it in Burgenland. That is the main problem in Lower Austria. They have a special part in their act that says about 500 m from a "1 building farmer." They have 500m and to a special height. I don't know exactly. But we don't have it in Burgenland. In Burgenland we have 5 old buildings which are separated. The other ones are all in the communities. Because between two communities, you have 5 – 10 km distance so you don't have the problem of building a wind farm.

I see. So they are still within the range of the village so it's okay.

Viola: Small villages but in between you have 5 – 10 km, so we don't have a problem of raising our wind farms. In Lower Austria, they have the problem much much more than we have. When there is the village and there are the small farmers, they don't have the space that they can say to build a wind farm because they don't have the distances. Here, it is no problem. Therefore, we can also build the wind farms with 79 or 69 wind turbines. Andau is here and Mönchhof/Halbturn is here, and in this small area, we have about 150 wind turbines. It looks like one big wind farm.

Viola: The next important step is the environmental impact assessment. We have 15 different environmental impact assessment certificates: engineering, electrical, shadow impacts, etc…Shadow impacts is very important for the inhabitants of the villages because they fear they

will sit in the garden and be in the shadow of the blade. That never happens because of the distances we have to keep. We have the material assets and cultural heritage. There we had a big problem we established the Potzneusiedl, the Enercon 126, the big ones. We found the parts [remains] of an old small village and also old bodies.

As soon as that was discovered, that site was off-limits?

Yes, it was immediately stopped for 1 – 2 months until they could bring every part and every bone into security in the state office in Vienna. After the archeological team, we were allowed to build the establishment. We also have waterways, traffic engineering, fire protection and building construction, aviation…The red lights on top of the turbines.

Is there a certain distance from airports and wind farms?

Michael: We don't have an airport. In Lower Austria, usually you have a distance to the wind farm. You can build a wind farm [only] so high…the government gives you the height of the turbine.

Viola: In the UVP, they say there is an airport and there is a maximum height. You also have the sound and acoustic. When the turbines are working, you have an acoustic sound but it is not very loud. There is 35 dB when you are in your house. It is not allowed to be louder than 35 dB. Therefore, we need from the turbine production firm a certificate. Then, we have forestry and hunting. We have no problems with them because…

Michael: Because they get money.

Who gives them money? For leasing the land?

Viola: There is a hunting area and they pay money for this area. They lose some of this place, and so we also give them some money for this place.

Michael: And sometimes we buy, not often, some land that they can hunt on this land. Like make a trade.

What do you mean by medicine?

Viola: Because of the acoustic noise, the people fear an impact on their health, which does not exist. Infrared sound. Therefore, the distance should avoid any impact on your health. You will always have people that say, "When you a wind farm, all of the people get ill. Bleeding out of their nose and horrible headaches." We hear everything. Now in Burgenland, we have about 490 turbines. It seems to me very healthy.

Michael: Only one person was hearing a [makes low, dull noise]. We take a measurement two times with the government [office] of acoustic. They can't hear something with their measurement. He said when we buy new windows for him, it's okay. We said there is nothing but the next steps are to file an accord. But he doesn't want anything. He said it was all over.

Viola: There is no real impact and no problem for us. And geology, tourism…We cannot have any negative affects. A lot of people come because of the turbines. Also governments, all interested from all over the world because of this perfect region with a great amount of turbines…The committee from the European regional development. Such people are interested in this all year. Then, we have the nature conservancy and agriculture. When there is any problem on any of these topics, we are not allowed to establish a wind farm. We have to fulfill all certificates to establish a wind farm.

Viola: A very big part is the wind measurement. This lasts 1 – 2 years. At the height of 90 – 110 m.

Michael: No, the new measurements are at the height of the hub height, in the middle of rotor diameter. 140 m.

Viola: The wind measurement is not only important for making the park layout, it's also for the bank because they want a perfect calculation before they give us credit or any contract. It's very important that we can pay the money back or not. Therefore, it's very important that we have perfect measurements and the calculation afterward with our guaranteed feed-in tariff. Then bank decides whether we get the credit or not.

Michael: Normally when we make a wind measurement and we see the wind measurement is not good enough, we don't build a wind farm. This is a point which is non-discussable.

Viola: After the wind measurement and bank guarantee, we start to construct our wind farm.

So you do permits and then the wind measurement? Are they both done at the same time.

Viola: Same time.

Michael: The wind measurements are often before we the impact assessment. The wind measurement is for 1 or 2 years so you need a lot of time.

Viola: It's one of the most important parts because when you don't have the wind, you don't have the power. You don't have to get the certificates if you don't have the wind. At the moment, we have a big measurement concept for each part of Burgenland using wind masts and LIDAR measurements. They are portable so we can transport it each month to a different area, so we can make a whole concept for a big region.

Viola: Okay, construction infrastructure. We have companies for it. The wind turbine establishment produces on it's own so we are not really involved. Then, operations and maintenance. We have our own maintenance team. We have full maintenance contracts with the turbine producers for about 15 – 20 years.

Michael: We do not do the maintenance ourselves but check the quality of the maintenance teams and the constructor. The constructor has the full-service contracts with us for 15 – 20

years. We know what they are doing in the turbines. The maintenance teams, what we have, are working before the constructor teams. They know where they can save some money, to make the service cheaper for the constructor. We pay the money, but the constructor needs not so much but gets a little more return. We check the quality of the turbine. If something is not correct, he must do it again. We have a quality system. We are certificated for quality.

Viola: Our maintenance team has a high quality because the chief of our maintenance team also makes the completion protocol for the other companies, for Verbund, and in Romania, and so on. When they are fully established, he drives there, looks it up, and sees if everything is okay.

Michael: He gives you the first certificate for the turbine, for when it was built.

Viola: Then it can start to produce because you have to have the allowance…that you can start the production. He cannot do it for our own turbines. You need an external specialist. An independent person.

Presentation of Energie Burgenland: Future Opportunities

Viola: Then you have the map that shows the wind potential areas in Austria. The next page [forecast] is there may be future suitability zones. This is also in the north of Burgenland, in Parndorfer Platte. Maybe in Eisenstadt, we have expulsion zones in Mattersburg. And also in Oberpullendorf, but the wind is weaker when you go down south.

Are the suitability zones that have been set out by the state government sufficient? Do you think they are too strict? Or with the increasing amount of wind farms, are there still open spaces that are eligible for development?

Viola: There are for sure open spaces, but maybe not in the north because there are already a lot of wind farms. Only in the middle of Burgenland, in Eisenstadt or Oberpullendorf, there can be space. There is the question of what will be the next Green Electricity Act. The wind is less [powerful] from Oberpullendorf to Eisenstadt. When you have a bad feed-in tariff or no feed-in tariff and a bad wind situation, you can't establish anything. Therefore, only the north of Burgenland is really productive and also works well with a lower feed-in tariff.

Michael: But there are some turbines for lower wind, with longer blades. Not so high nominal power. These turbines are better for these wind areas with less wind. They are also expensive.

Viola: The problem is also the height. In Burgenland, we have a restriction on height. They say for some suitable zones, it is about 140 m height. That is not much. Because in a bad wind situation, all you need is the height. When you have 200 – 220 m height, it is much easier to establish a wind farm because you have a bad wind situation but it all comes with the height. It's an exponential function. Therefore, the most important factor is that the government would say, "Yes, you can build it there. Instead of 140 m, at 220 m." You could use all wind turbines and would be much easier. The height depends on every zone: 140 m, 150 m, 180 m, etc. This is only in Burgenland. In Lower Austria, they say the height doesn't matter. You can build at 180 m or 220 m. They [Lower Austria] government says because of this exponential factor, it is

better when the established firms make the higher wind turbines. Therefore, they don't have a restriction on the height. Not like in Burgenland. We have to go to the government and say, "Please make it higher."

There are still open areas in Burgenland ready for the development. And so far, what the spatial experts of Burgenland have worked out is okay.

Viola: It is okay what they have done because we really have a strong development. A lot of possible wind farms. It's much easier than Lower Austria or somewhere else in Austria. There are also, for the future, it will be needed for the repowering [potential]. In repowering, the wind farm was 150 m and in the repowering process we go up to 200 m. And as I mentioned before, in the bad wind situation zones, they go up to 220 m. Then, it would work. It is a running process because the government works on it all the time with us. It is a government. You cannot say the government is "sleeping" or something like that. In Burgenland, they really do something for the improvement. The height is a big problem in the future.

Viola: For the grid, we are not the experts because of the unbundling from the electricity act. When you want really good grid information, you have to go to Netz Burgenland. We have to be in separate places. The whole organization separated.

Is that positive? Is it a good thing that you are now separate?

Viola: They made it for the market. When we as an electricity company make a wind farm, we don't have many advantages.

I am interested in the grid connection points. How is that factor in picking a site? So where a wind farm site might go, how do you determine the substations?

Michael: Most of the substations we build.

Viola: We built a lot of the small substations. The 30 kV grid stations are ours, the 110 kV is from Netz Burgenland, and the bigger substations are APG with Netz Burgenland.

Michael: Two points of connection. From our station to the Netz Burgenland station, and from the Netz Burgenland Station to APG.

So Energie Burgenland Windkraft GmbH develops wind as well as the initial substation. What size is that?

Micheal 30,000 volts. And then it goes to 110 kV. 80 MW is the transformer in the big stations.

Viola: In the [APG] ring-grid, it is 380 kV.

Michael: You have 30,00 volts, then 110,000 volts, and then 380,000 volts.

So after the initial substation, the rest of the grid is developed by Netz Burgenland and

APG.

Viola: Yes.

So for selecting a site, you can make it anywhere because you are designing the substation. And from the substation, you can work with Netz to construct whatever they need to.

Viola: The substation is built wherever it is needed. The substation for the wind farms in Andau and Mönchhof/Halbturn are built with competitors, two other companies. We build the substation in the middle of the wind farm. It should really be near or in the middle of the wind farm.

The ability to make a substation. Is that something that sets your company apart or is different from other wind developers? Or are most starting to do that work as well?

Viola: All competitors have to do it. We have no special position. We are like the other ones. When they want to build a wind farm, they also have to go to the grid company and say we want to build a wind farm in this area. You have to give them the exact GIS points [of the turbines], and they may say that they have a free substation with enough capacity. Or, if there is not enough capacity, they have to extend a substation or build a new one. For every competitor on the market, it's the same situation. The grid company has to allow it for every competitor on the market to feed-in the electricity.

Michael: We have to build a new system if the old system is full.

Viola: It's like the feed-in tariff: first come, first serve…We have the wind farm and go to the grid company and say, "We have 30 wind turbines with 90 MW nominal power." They approve or say when we have come too late because the competitor has already submitted their wind farm. It's always first come, first serve.

Appendix G

Interview with Helmut Maislinger
Senior Consultant and Managing Director for the Department of Biology
Energiewerkstatt Consulting GmbH (EWS)

November 24, 2014

What physical or environmental conditions does EWS require for wind farm development?

One of the most important things is you need a lot place because you have to keep certain distances to houses, to villages, and so on. You have to keep certain distances to some infrastructure facilities like highways or overhead power lines, and so on. This is the most important thing, of course. If you find a place where you have the possibility to keep all those distances you need, then, of course, you have to look at the wind conditions at the site. But, most often, before you look at the wind conditions, you look at the place. Is there enough space in this area for wind farms? Because that is easier to find out. Because, for the wind conditions, you need wind measurements. They cost a lot. Of course, there are some basic climate measurement equipment of the state authorities, for instance. But they don't give you the information you need. At the first step, you would look if there is really enough space for wind turbines in an area. Then, you look at the wind conditions. You look at if there are some protected areas, concerning environmental protection and so. Well, what is important is where is the next grid connection possibility and how far it is away. Because if the place is just big enough, for instance, three wind turbines and you have 30 km distance to the next grid connection point, it would be difficult. The whole project would be difficult. You also have to look at how you can transport the turbine parts to the site, because in some areas this can be difficult.

I am thinking about mountainous areas, somewhere in the alps. Depending on the conditions there, it can influence the costs on the one hand, and the impacts to the environment depending on where you have to build your roads and so on. Concerning the transport of the turbine parts to the site, there have been some developments [made] in the last few years which would make it easier. Because if you are at mostly flat or hilly terrain, the turbine manufactures tells you that a bend in the road has at least a 50 m radius, but if you have special vehicles, which cost a lot, it is possible to use roads with, for instance, a 20 m radius. They can lift the blade so that is not more horizontal. That helps. These vehicles did not exist 5 – 10 years ago, for instance. This would help in alpine terrain, for instance. In general, I think, these are the biggest issues.

You mentioned that the turbines have to be a certain distance from homes, roadways, etc. Is that determined by each municipality? Is it regional? Federal?

It is depending on the federal state. Some of the states have laws which tell you and others just have guidelines. Burgenland has just a guideline that says 1000 m away from villages. In Lower Austria, you have to keep at least 1.2 km from the next village. This is the spatial planning law. This is different across federal states. For instance, in Lower Austria, two single houses somewhere in agricultural land, [developers] just have to keep at least 750 m by law. But, this is

not the only thing you have to take into account when building a wind farm, because you also have to take into account shadow and noise emissions. Most often, and depending on which turbines and how many turbines, these 750 m is not enough. The law says this is the distance you have to keep at least, but when you are doing your shadow and noise calculations, you will see very quickly that this is not enough. The 750 m is in Lower Austria for single houses, and so on. And 2.1 km is to villages. You find it in the Niederösterreich Rahmenkonzept [Lower Austria Regional Framework].

You mentioned the distance to the grid connection point. Who controls the grid connection points?

The grid operator. Mostly, the owner [of the grid operator] is the federal state. Normally. Maybe not 100% the owner of this company. Most often, more than 50% owner of this [grid operations] company.

Is there a minimum distance to the grid connection point for an average sized wind farm? A maximum distance?

Well, it depends. The grid connection point is the substation. If it is just agricultural land, it would be easy and cheap to dig the cables into the ground. If there are a lot of villages, or we have to cross a river, or roads, or railways, and so on, that makes it much more expensive. You can't say 10 km is good or bad. It depends on the relationship between the cost of this [substation] and that [wind farm]. Very often in Austria, we have distances of 5 – 15 km. This is most often not a problem, even for smaller projects with 10 MW or so.

Is this done up-front when you find a suitable space?

You find a suitable space, and in this phase the developers with experience know…this is okay. You don't make very accurate calculations about the costs at this time. Normally, they have to build very fast to get this [wind farm] fixed. They need the okay from the municipality, from the mayor for instance, on the one hand, and from the owners of the land on the other hand. If they get their contracts with them, then they can fix the project. It's safe, more or less. No one else can come and say, "I want to build my wind farm here." Very often, this is the problem in Austria. You don't have so much space any more for wind farms in areas where the wind conditions are good and you don't expect negative impacts on the environment. Most of the places where we have good wind conditions, good ecological conditions, and where the mayor wants a wind farm there, those places are very rare now. Everywhere there are wind farms on these sites, more or less. You can choose to wait until the mayor says "Yes" because the last year he said "No" to wind farms. Or go to the areas where the wind conditions are worse. Or go to an area where the ecological impact is worse, and maybe you don't get the permits then. You don't know that exactly. But now, [for] the few the places that look good, there are many developers trying to get the contracts on these places now. In my opinion, in Lower Austria and in Burgenland, all the places are more or less fixed who will make the wind farms in the next years there. And then we have to see if there are still fertile places. Because in Lower Austria you now have the Sektorales Raumordnungsprogramm that says the state authority looked with some experts, over the whole country, where you can erect wind farms. They found out the areas

where, in their opinion, it is possible and where you can erect. This is the Sektorales Raumordnungsprogramm. They have maps of these areas. These areas are fixed in the Spatial Planning Law in Lower Austria, the Niederösterreich Rahmenkonzept. Similarly in Burgenland, you also have the eignetzonen…positive zoning. Zones where you can erect wind farms. They are not fixed by law. It is just the recommendation in Burgenland. It's like a law, I would say. It's very difficult, or nearly not possible, to get permits outside these zones in Burgenland. It's much more easier to get the permits inside the zone in Burgenland. In Burgenland, if a developer comes with good arguments, he has the chance that he gets a zone in the area where he wants to erect wind farms. If you look back into the past, this eignetzonen or positive zoning get more and more [wind farms] every 1 – 2 years. I don't expect that is Lower Austria because of their Paragraph Neunzig Zonen. I think it won't at least 5 – 10 years. These plans are overworked and then overruled, that you get additional areas where you can erect wind farms. There is a difference between Lower Austria and Burgenland, in my opinion.

In general, how long are the leasing contracts between land owners and wind farm developer?

The contract depends on the land. At least 20 years, but most often longer. Or maybe they are unlimited. Most often they are rented but some also buy these.

When a site is identified and the negotiation process starts, is there a public participation period? Are other stakeholders involved in this process?

If you are in an area where the people living there know about the wind farms, because there are some wind farms in the vicinity, they most often don't have a problem. In this case, public information is at a very low level, I would say, because it is not necessary.

If you want to erect a wind farm, depending on the federal state, the wind turbine area or at least the area where the foundation is, the spatial planning needs a certain widmung (dedication) for this area. The authority that makes the flächenwidmungplan (surface dedication) is a local development plan. Wind farms are most often planned, here in Austria, agricultural land. Sometimes in forests. If you want a wind farm to be built or permitted, you need a change in the local development plan that says you are allowed to erect in [specific] place.

In Lower Austria, just the foundation has to be somewhere in this zone. In Burgenland, the whole rotor has to be [in the zone]. If you have a very little zoning area for wind farms in Burgenland, the rotor diameter must be within this area. For instance, if this is 50 m, the diameter of the turbine is allowed to have 50 m. In Lower Austria, in the same area it would be possible to make a, for instance, a 126 m diameter turbine. The authority that makes this zoning plan is the Mayor and 10 – 20 political representatives of the municipality. They have to say "Yes" to the local zoning, so at least they know about the local wind farm, so a little bit of public consultation in every project. For this local zoning, the planned zoning is showed to the whole public. They can go there to the office and have a look at it, and say "No, I don't want that" or "This is okay." Most often, they say nothing.

A little bit of public consultation you have everywhere. This is not from the developer. This is

because the local planning authority has to do that. If you plan a wind farm in an area where the people have no contact to wind farms, most often it [public consultation] makes sense. Most of the developers make public consultation a part of the work. They [the public] have read about noise, infrared noise, shadows, and so on. There are so many questions and most often it is better to answer these questions before they get too worse and they say "No" because they are afraid, even if they don't know anything about it. Public consultation is a topic, but depending on the certain project, the developers decide what they do and when they do what because the time is very important. And who they consulted, which period of the project, and so on. It is of course important.

You were saying that each turbine has to be zoned, rather than the whole farm. So, piece-by-piece?

Yes, most often it is piece-by-piece. In a few cases, you also have a huge zoning area. I don't think I've see such a zoning area has a place for more than five turbines. Actually, this wind farm in the alps in Styria, I think there is one zoning area with thirteen turbines. That is the biggest, I know, in Austria. The state authorities who say yes or no to that they change their mind very often. They are experts.

The second half of my work is a spatial analysis. Do you have any recommendations for how I can find the coordinates of specific wind farms and wind turbines. IG Windkraft has the wind farm locations but it is very general.

One authority who has those exact locations is the Austro Control (Aviation Authority), but I am not sure if they can give that information…At the homepage of the state authority, you can find the flächenwidmungplan and know the places where turbines can be erected. You can also ask APG and the state operator like Energie Burgenland.

I am curious about the collaboration work that you do with NGOs, as well as with grid operators and developers.

Concerning NGOs, if we think or if we know that a certain site or a wind farm will make serious ecological problems, we will talk to the NGO which is affected. If birds are the topic, most often we will talk to BirdLife, or they will come to ask the developer. For instance, in the process of the creation of the *Paragraph Neunzig Zonen*, BirdLife was involved. In Burgenland, BirdLife is involved in creating the eignetzonen, the positive zones. Until now, I think BirdLife is the only NGO which has been involved before a certain project. They are those who are affected mostly, except maybe the bats. There are different NGOs which are working or helping the bats in Austria. The most important in my opinion is Koordinationsstelle für Fledermausschutz und Forschung in Österreich (KFFÖ). Some months ago, they gave out a position paper. They are the only bat organization that did that until now. That underlines what I said. They are the most important in my opinion. The thing with the bats…it's not so easy to assess. On the other hand, for bats, you have good mitigation measures. For example if the wind speed is higher 8.52 m/s and you shut off your wind farm, you won't have nearly any collision with the bats. This mitigation could be easily implemented.

I also wanted to know about collaboration work with the electrical operators.

Each developer has to contact most of the them. Not at the very beginning. More or less, early in the planning phase [the developer] contacts the grid operator because you have to tell them, "I have a project with about 20 MW and I need the grid connection for this project." One of the most important things is to get the information "Yes, you can connect to the grid" and the point of location where you can connect to the grid. The cables from the grid connection point to the wind farm need a permit, and therefore you have to know that. Depending on the sort of permit process…you have to come through a certain permit process. There are different permit processes in Austria. One of those is the process concerning to the Umweltverträglichkeitsprüfunggestez (UVP), the environmental assessment permit. This is a permit process which includes all necessary permits for nature protection, the technical permits, the building permits, and so on. Everything is included in the UVP. If you have to do this UVP, you need the point because the project is defined differently depending on the sort of permitting process. If you have the UVP, you need from the wind farm to the grid connection point. Everything around can influence or impact the environment, and the environment in a wider sense including people. If you dig a cable to a certain point, you can cross a habitat that is very important for a certain part of life, for instance, and you have to assess that impact. Therefore, this grid connection point is very important from very early on.

In Lower Austria, the grid operator is the sister of EVN Naturkraft, a wind farm developer. If you say, "I have a potential site here and I want a grid connection there," the information will go directly to the sister of the grid operator. If you don't have contracts for the area, for the plots, for the owners of the grounds, if you don't have contracts with the municipality or the mayor, you have lost your project before you get the grid connection. They are talking and giving information to the sister, and they try to make the contracts there. If you haven't fixed them, maybe it is too late. You really have to be careful when you say what. At which time do you give out information and to whom? This is very important. Normally, the unbundling should have taken place by now. They are saying in the EU that the…

You had mentioned unbundling as something that you would like to see take place.

This is really a problem until now. It is similar in Burgenland…Normally, it would be better to tell the grid operator early on. But the developers can't really do that if they have not fixed the contracts. Otherwise, they lose their projects.

What is the name of the developer in Burgenland that is related to Energie Burgenland [grid operator]?

It is Energie Burgenland Wind. They change their name very often. Some years ago it was Austrian Wind Power. Now their name is Energie Burgenland Wind. This is my opinion. If you ask them, they will tell you something different.

Are there any other policies or recommendations that you would like to see changed or implemented that would grow wind power in Austria?

In federal states where the grid operator or the sister of the grid operator is developing wind farms, all of those states where it was possible to erect wind farms in, more or less, bigger dimensions…this is first [happening] in Burgenland. The other one [where it happens] is Lower Austria. In all of the other states, it was nearly not possible to erect wind farms. There are some wind turbines in Upper Austria, but it was very very difficult in the last years to make wind farms there. On the other hand, it was Styria where you have some wind farms but now the Styria grid operator, or sister of them, makes wind farms too. Maybe Styria is an exception because it was more or less easy there, although didn't develop wind farms by themselves for a long time. But if you look at Carinthia or Tyrol or Salzburg, it is horrible. On the other hand, you have to say…well, the potential for wind farm development is not so big in Salzburg, Tyrol, or Carinthia because it is more difficult in the mountains. That is clear. But there are some places where it is possible, in my opinion. It's obviously too difficult because there have been people who have tried, especially in Salzburg. In my opinion, if it looks like the grid operator is not interested in wind energy in a certain federal state, the political system does not support wind energy. That looks very clear to me. You just have to look at the different states and you will see that. You asked what could help wind energy. In my opinion, if the influence of the grid operator in the political system would be smaller, that would help wind energy.

Appendix G

Phone Interview with Florian Marimger
Energy Economics and Technology
IG Windkraft Österreich

December 9, 2014

I'm interested in where wind development is going and what it might look like in the future. Following the Austrian Wind Energy Symposium, can you briefly summarize the key topics?

The main issue is how the support mechanism will develop because there are some trickle-down effects from the European level. There are state aid guidelines. How state aid can be created. In Austria, if there is a new support mechanism, it has to be developed with this view on the state aid guidelines, and the European Union has to confirm that it is compatible. That's a big issue because the state aid guidelines are not really based on evidence. They are more based on pressure groups and what pressure groups want to have. At the moment, we are not very okay with that. It's similar in the US, with the production tax credit. It's always some kind of insecurity in the system. It's not very good. It makes the whole system more expensive and more difficult. It's not the best for stable development of technology and energy production. In terms of technology, it's bad because you know the industry won't invest in new developments, research and development, if there isn't a stable framework for the future.

Of course, there are zones in Lower Austria and Burgenland where wind power can be developed. I think if there are [suitability] zones in the future, it's always a question of how the framework for those zones is [developed]. You always have to include different stakeholders, like BirdLife, the landscape engineers, and the people of course - the public. It's always difficult to say how to people will react to more zones and more wind power. Usually in Austria, people are very pro-wind energy. We had some surveys in the past saying between 80 - 90% of the people are pro-wind energy. It's one of the most favorite forms of energy production. It's always difficult. You know the NIMBY problem. It's also a question about how people react on new zones. Or if there is, for example, a problem with BirdLife or landscapes or whatever. It's a very volatile form of energy production and it's a volatile form of development.

Is repowering an important issue right now, and how will that affect the zoning?

I'm not sure if repowering is affecting the zoning. It will. Repowering is, of course, an important issue. If there is an effect...it's difficult. There is a huge potential for repowering because the new turbines are much bigger and much better in terms of energy production. Then, there is a higher potential of energy production. I'm not sure if that has a big influence on the zoning itself. The view on zoning is increasing the energy production potential in total and not just giving an opportunity for repowering. Currently, it's an issue but not that big.

Even as the height changes for the turbines, there won't be an issue in the near future?

It will be an issue, but the discussion just started. We are a few years behind Germany. In Germany, it is a big issue. Coming in the next year, we will develop [more areas]. Then, the next years [after], it will be a big issue. As well as service and maintenance because or turbines are not that old.

In Burgenland, are there any new developments? What does the future look like there? It has a quite a lot of wind turbines already.

At the moment, there is not much development any more. There was in the past because of the zoning, but now the zones are, more or less, not full but nearly filled. I think they are discussing about increasing the zones or if the zones are still adequate. The conditions, for the zoning, are still varied. For example, they conducted a study regarding birds and the influence of wind turbines on birds in Burgenland. The outcome was that the effect of wind turbines on birds was much lower than they expected. They expected a much higher impact when they did the zoning. Now they see that there is no impact or a small impact. That might lead to other zones or a different zone design. If there are new zones, I think there will be more development. Economically, it's very very good for Burgenland because they had nearly no power production in the past. Now they have it with wind energy. They also have a supply chain for suppliers of turbine parts and services. For the nature, I think, at the moment they don't really have a problem because the region of the Neusiedler See – Seewinkel National Park is not part of the zones. They have a very very strict processes in the approval phase for the Environmental Impact Assessment. The environment, landscape, and birds are a huge issue. It's very strict in Burgenland, Lower Austria, and, I think, in the other parts of Austria as well. I don't think there would be a potentially extensive problem. But there is still potential [for development]. At the moment, it's very early. Everything is in the very early stages to know if there are big zones, new zones, new zone design, or whatever. Regarding the potential itself, we published a study recently about the potential for Austria. I think there is a card just talking about the wind power potential in Burgenland. It's in German but there is a summary.

I want to ask about your participation in TransWind. I met with Patrick last week and he told me about the project. What has your experience been so far in the TransWind project and working with other stakeholders.

Usually, we are accustomed to working with different stakeholders because it is a part of the development of wind energy in Austria. We always have lots of discussions with everybody about it because it is a landmark. TransWind is just another part of those discussions. We are involved in it as a normal partner or member of the panel, but we don't have any possibility to influence the project in one or another direction. I think it is an interesting project. We will see how well the outcome will be. For us, it's always difficult if people are working on that because if people are still trying to find valid potential in Austria, it's difficult if you don't know the history of wind energy and you don't know the stakeholder environment in Austria, it's difficult to get it within a year and get a valid potential. We see its positives and negatives.

Appendix G

Interview with Gregori Stanzer
Austrian Institute for Regional Studies and Spatial Planning (ÖIR)

December 10, 2014

As the architect behind Burgenland suitability zoning, can you walk me through the process of how those zones were created?

It's a project of the Federal State of Burgenland. Starting from the beginning, there were many projects building around the space of the Parndorfer Platte. The environmental agency of Burgenland said, "There are so many projects right now. We can't evaluate one. We have to look at the whole surrounding [area] of the projects. There must be a regional concept and a regional evaluation." This was the start of our regional concept or regional framework for wind farm planning. The federal state of Burgenland asked us if we could do that. This was in 2002. They asked us if we could do that, and we agreed. We worked together. In the beginning, the Umweltanwaltschaft [Environmental Advocacy Agency] and Hermann Frühstück.

So this federal group approached you to start?

It was a problem of the spatial planning group in Burgenland. The Umweltanwaltschaft [led by Hermann Frühstück] accompanied the project, and he organized the different interest groups of nature conservation. This was quite urgent and quite important that the nature conservation have been organized. Very helpful. What we did was to pick up all the information about the region and all the concepts that have been created there, and develop zoning. It was the first zoning in Austria concerning not only nature conservation and BirdLife. It started with a workshop. When we sat together with bird conservation people, they said, "Well, this is not our zoning and we don't want to do something there." And we thought it was necessary. Otherwise, you could have some problems. And then they started to work with us.

So you worked through that together? There was a grouping of environmental groups and you had to consider other stakeholder groups?

It started with the IG Windkraft as the wind power interest group. They accompanied, in the beginning, our work. There were many groups we organized. We had a very spatial approach. We looked at…all the results you could say were spatial. Not only for one project but for a whole region.

So what were some of those factors?

Settlement development. This was one aspect. Another is tourism. Tourism development. We had good luck that there was tourism zoning. We had to regard Lake Neusiedl or Lake Fertö. It's the most important tourism region in Burgenland. Later on, it was the national park

[Neusiedler See-Seewinkel], a big nature protection area. Later on, the Neusiedler See became a [UNESCO] world heritage area. Infrastructure and infrastructure planning was very important. At the Parndorfer Platte, there is a big railway connection from Vienna to Budapest and from Vienna to Sopron. There was a planning, at this time in 2002, to connect Vienna to Bratislava with a big motorway. At this time, there only was the planning and not in reality. We regarded this planning. Another thing was [that] over this motorway, there were some green connections for deer and other big animals. These green bridges, later in 2007 – 2008, there had to be a distance regarded or acknowledged.

Like a buffer?

Yes, like a buffer zone. In 2002, we had been the first [organization] in Austria who were looking for buffer zones across settlements. Buffer zones of 1000 m, which was at this time was quite a big zone.

The 1000 m is the distance between a village and a turbine.

Exactly. These areas should be reserved for windkraft. I'm not sure if at this time the recommendation was accepted or it was introduced. Everything was quite at beginning.

So those factors were accepted.

Yes, they were accepted. It was quite interesting. At the beginning, there was…one big player began to play his role. It was the Austrian Wind Power, now called Energie Burgenland Windkraft. They just began to define their role. It was only one.

What do you mean by that?

To define their role? They had to discuss in their company if they should start with wind power planning. It was very small at this time. This part of their company. And they grow and grow and grow. In fact, there was one very very small company called Oekostrom. There were many different projects and one private company, which was the Püspök Group. They all started very small and now they are quite big. The big advantage, and you know that already, is of the zoning. The wind energy companies could rely on this zoning and the results. They respected it and could rely on it. Later on, when they had to go to federal state departments, it was much easier for them to get a "yes" for permits.

Was one of the spatial factors the electrical grid? Were substations, transmission lines, or anything like that included as a measurement in the suitability zones? To interconnect the electricity generated from the wind, would a site be suitable if had such infrastructure or not?

You mean the electrical grid concerning the possibility to move the electricity? In fact, it was the just the opposite. We have the situation in Lower Austria. There, each wind park developer has to speak to the Austrian Power Grid (APG) for transmitting their electricity. They say, "Yes, here our netz [network], our transmission lines can afford some amount, so many or so few, wind

power plants, and then it is full." This is the situation in Lower Austria. Here [Burgenland], this is the big advantage of the zoning. They [APG] could say, "Well, we need to upgrade the transmission lines and upgrade the big substations as a contribution of networks. You [the wind developers] have to upgrade it for this amount because the zone shares a place for so many wind farms." In fact, Energie Burgenland Windkraft spoke with Verbund/APG and said, "Well, we have to upgrade the lines for this and this amount." This worked very well. But, of course, there was the big advantage of the high circuit line of 380 kV and 220 kV was already there. It was a well infrastructure area.

So Verbund/APG were approached by the different wind groups asking for support, and they said, "Yes, we can assist." What did they help with exactly?

In technical terms, it was the umspannwerk [substation]. The place where the circuit lines go together. The lower circuit lines, maybe 50 kV, they upgrade it to 220 kV or 380 kV. In fact, they built a new umspannwerk to feed-in the big circuit lines, transmission lines. They knew for which degree they had to upgrade this umspannwerk and they had to build it.

Do you know if they location of the umspannwerk is available? Could I find the locations of that anywhere? I want to create a map of the different inputs.

I'm not sure if we have it. The umspannwerk, Energie Burgenland has it. And APG should have the big ones. I think it's not quite easy to locate it. To locate it, you have to go over much detailed data. They just have it [draws a picture of the electrical grid]. A figure, but not located very fine.

Is it possible to download the suitability zones?

The problem is that they are changing. The big thing now is the repowering. They are just starting. We are starting with the planning for repower. Repowering is bigger plants with other effects than before. Next Wednesday [December 17], I am in Eisenstadt to show our results to a group of 25 persons who are talking about. Hopefully, they will decide that it's alright. So, the zonings are changing. A special thing we do in Burgenland. In the zones, we not only say, "Here is a settlement and here is the distance where there can be a wind park. This is the suitability zone for the wind park." This zone is for the maximum height of, let's say, 186 m or 150 m. Now, in the zoning for the repowering, the [wind] power plants are taller. Now the discussion is, for [wind] power plants 200m or more, how far do we have to go from the settlements? The zone changes in two ways. The distances to the settlements get bigger and the maximum height of the power plants change. It's a changing process and that's the reason why it's not easy to get the just-in-time correct zone.

Is it possible to get the old zones?

I will have to ask. I asked half a year ago. The answer from the Federal State of Burgenland was, "We don't want to give it away."

I want to ask about the rezoning. Is each zone changing for height? Or is it for all zones

across the entire state?

In fact, we look at each zone. For each zone, it's a very spatial result and a spatial investigation. Together, once again, with the Landesumweltanwalt with Hermann Frühstück. The process…I just had some calls with Bürgermeister [mayors] from the communities. I called the mayors of these [Burgenland] communities who were concerned with the repowering. On Friday [December 12], I am in Burgenland to tell the mayors what can change in their communities. Just one week ago [December 3], we talked with the wind power companies. Because…in one zone there is one company who has the wind power plants, and in another zone there are three companies. In one zone, there is even a fourth company. They match and they work together, and they are interested. It's a big discussion. So there is a discussion with the companies, a discussion with the communities with the mayors.

And the public?

We say the public is represented by the mayors. And a very special thing in Burgenland is the Bayerat of spatial planning, the persons who are looking for each spatial permit. Each community has to say, "Well, we change our spatial planning ideas but the Federal State of Burgenland has to say, 'Yes, it's okay that we change our ideas of spatial planning. We have a map of zoning. We change the zoning map." There are many experts and they look at it and write something. Then, everything comes to the Bayerat, an agency.

A Bayerat for each municipality?

No, it's all across the whole Federal State of Burgenland. It's one Bayerat. Maybe the experts of the Federal State say before, "It's very bad. We don't want it. Change your project." But in the end, it comes to the Bayerat and they discuss it. This is the discussion we have in one week [December 17] for the rezoning for the repowering. The special thing in Burgenland is that the Landeshauptmann [governor], he is the political representative for spatial planning. Really, the most important political person is the person most responsible for spatial planning. These agencies are always guided by the political representative. In this case, it's the Landeshauptmann.

Is that the same in other states?

It's the same in other states that there is such an agency, but their importance depends on how important is the political representative or the person responsible. In Burgenland, it's the governor. In other states, it's the Landesrat [provinicial]. It's political but not the highest one. The special thing in Burgenland is that in this agency there are the two big political parties that are represented. So it's not clear which way this agency is going. It depends on the matters they discuss. It makes it quite interesting. They really talk. It's not, "Well, we know what you want to tell us and it's all right" or "You want to tell us, and go away with that." It's just really a discussion. It's very special. That's one thing you have to keep in mind to have a better understanding of what's going on in Burgenland. There is quite a high discussion culture.

Is there a period of public input? Not just the representatives.

In fact, it's afterwards. After the zoning. For the time when you do the permits. There is the kuntmachen, the time when it is announced. Now something is changing. The spatial planning of the community is changing. This is the first step where it is announced in the public. The second step is the environmental integrity assessment. Then there is the special project.

So there is a period of comment for the public after the plans are released?

Yeah. It's not only an expert result, or expert work. We try our best but we include this discussion for the zoning as well. We have to discuss it in this agency. We have to show our method to this agency in the beginning. We say, "These are our criteria. We discus it with the Landesumweltanwalt, with Hermann Frühstück, with BirdLife, and we discuss it with different experts of the Federal States." This is quite a discussion process. But we don't say, "Well, now this is the result." In Lower Austria, they made it a little like that. They said, "Now, this is the zoning. You [public] can have a look at the zoning." But let's see. Maybe something is changing in the next 2 – 3 years in Burgenland in this direction. Another spatial thing is the World Heritage area. In Burgenland, the Lake Neusiedler See is a trans-border national park with Hungary. There was, in fact, a commission, a mission of UNESCO. UNESCO was in Burgenland 1.5 – 2 years ago. They were called from Hungary to look at the wind parks in Burgenland because the World Heritage [site] is trans-boundary.

Is Lake Neusiedler the only UNESCO World Heritage site?

Lake Neusiedler is the core zone. Some surrounding it is in the core zone. Even some parts of the surrounding settlements are in the core zone. Then there is a buffer zone. The site protection zone is quite close to the wind parks. The special situation in Parndorfer Platte is you can...I wonder if you will compare it to other wind parks in Europe or the United States. It's very high density in little space. In Germany, there is no area like that with so many wind power plants in such a small place. The United States might be a little bit different.

As these areas get quite full with wind farms, is this part of the repowering process?

Yeah.

With so many different components, influences, and political decisions, how do you really balance these factors to make the decision? How do you determine which factor is more important than other? Is it done through negotiation?

Yeah, the balance of so many different effects. We make a suggestion. The role of the Umweltanwaltschaft and Hermann Frühstück, he is always included. If he says, "The result is fine," then it is a good end to the discussion process. He is in the spatial planning agency as well. He is the connection to the NGOs, BirdLife, nature protection experts in the Federal State. We have him to accompany this process. This is one side of the balance and the other side of the balance is the wind park companies. And in the middle, maybe the communities. It's not so easy. We give our expert's investigations, we make a suggestion, we talk to the wind park developers, and then, of course, it's a little bit a political process. It's important that we are

asked. We do it completely different. Where it's important that the Landesumweltanwalt, he says what he is thinking. He shares his experts with the others. But, what we have, we call it an "analysis of dominance." It's dictated to the persons living in these areas…We look at the difference between the house and wind power plant. We have a GIS model of the terrain. We can see from this point, how much of the wind power plant you can see. How big is the field of view? This helps us to have a look at the different effect of wind powers at different heights and different distances in regard to terrain. We can compare one site of the wind power plant to another, always in regard to settlements. In the discussions, this is a very helpful tool we always use. We make very many angles. We have to know the terrain. We have to know the sites. It's not as simple as it looks…We have played around with it and made maps. "Here are trees, settlements, terrain. Where can we see only this part of it [turbine] or this part?" There might be some areas where you can see nothing. It's quite nice for a first glance, but this is really the relation you can get from settlements to the wind power plants in regard to height of the wind power plants. This is what we prefer to use. Now when we do the rezoning for the repowering plants for the suitability zones, these are all areas where we have some landscape analysis. If it's a technical area with motorways, highways, transmission lines, etc., then it is a suitable zone, a favorable zone for wind power. Now the repowering is all in favorable zones. We don't say, "This is a bad area for repowering." We have to look at distance to settlements and which heights. Maybe we have the possibility to say we have the effects of sounds…Looking at area, talking with persons, and sharing the expertise.

Appendix G

Interview with Elisabeth Stix
Austrian Conference on Spatial Planning (ÖROK)

November 25, 2014

From a spatial perspective of planning and policy, how does the process look for special wind areas? Is it federal or state-by-state basis?

It corresponds to the planning system...There is the spatial planning legislation according to the constitution. According to the constitution, the distribution of the legal competences is given as follows. At the national level, you have sectoral policies and planning if explicitly mentioned in the constitution. There is no national spatial planning competence. We don't not have national spatial planning policy. At the national level, we have some sectoral policies that do spatial planning things, like electricity planning, water, railways, highways. There we some national laws. Important for you is the Federal Ministry of Science, Research, and Economy and the special laws. Electricity and high voltages lines are at the national level. Also at the level of federal states. National planning for electricity is done at the Federal Ministry of Science, Research, and Economy. Have you seen the Austrian Power Grid (APG)? This is the institution that has to do the planning and functioning of the high-voltage grid.

Yes, I've sent many e-mails to them and am trying to set up an interview.

They have a lot of things at their home page. They have a national plan. They have some strategies. In the strategies, they have some nice maps with the grid...We worked with them in a project: ÖROK-Publication No. 189 Fundamental Framework for Securing Space for Line Infrastructure Projects. We have an overview about this from Mr. [Arthur] Kanonier from the Technical University of Vienna. There, he points out the competences for the line infrastructure, things at the national level and the Länder level. We have this for railways, highways, and high-voltage lines. It is a study of where the competences lie, and what they have to do or not. There are a lot of tables...I will also check the name of the guy from APG and you can refer to me.

You were saying that sectoral policies are done at the national level, and electricity is one of these but each Länder can develop their own laws.

In Austria, spatial planning is done at the Länder level, and we have nine spatial planning laws. They differ quite a lot. They gave the basis for spatial planning and to the instruments that are used in the Länder. And you have to take into account that sectoral things are done at the Länder level, like regional traffic, public transport, or the lower-voltage lines are also done at the Länder level. That is quite complex. So for spatial planning, nine laws. The nine laws give the basis for spatial planning and the instruments that are used at Länder level. More or less, they have some sectoral strategies, strategies for the whole land, and they have the spatial planning worked out at the community [municipal] level, and they have to be observed and monitored out by the Länder.

The policy and strategy for wind power is worked out at Länder level. The instruments that can describe the development and can give the basis are the sectoral plans, like those in Burgenland. There is the sectoral strategy for wind farms. I hope you know it. That is a very important and, I think, a very fine instrument. This is the competence according to the constitution. These are instruments you find at each level for spatial planning. For the Länder level, you have the spatial planning laws and you have regional and thematic programs. For example, the wind power program from Burgenland is a regional level strategy. At the community or municipal level, this has to be transformed or given to the plans at the municipal level. The strategic regional approach in Burgenland was one of the first ones that did this regional wind power strategy. In Lower Austria, they did it last year in June.

Yes, some people were saying that they [Lower Austria]did it too late.

Yes.

When we were talking about electricity and spatial planning at national level competence, does that only relate to the grid and the high-voltage lines Does electricity only mean spatial planning for the transmission and distribution lines and infrastructure, and not the power generation?

Yes, the lines and that everybody has enough electricity.

Balance?

Yes, balance and support. The distribution is from the national perspective. Rather, which kind of electricity is selected at regional levels. The Länder have their energy mix. They are regional institutions that are responsible for power, like hydropower or wind power. There are some "half state" institutions that organize it. With electricity, you also have to take into account European legislation. For Lower Austria, the hydroelectric plans are organized by Verbund. In Tyrol, you have the Tyrolian power organization. In every Land, you have an organization that is responsible, for example water power or wind power.

Energie Burgenland is another.

Yes. The policy and the strategy is worked out at the administrative level at the Länder. Then, the organizations are private...The strategies, especially the spatial planning strategies, are worked out at Länder level. If they do it good, they have a strategy.

Reviewing May 2013 presentation: Aktuelle Themen der Raumordnung & Tätigkeiten der ÖROK

I worked out an overview on the instruments and strategies used in spatial planning [at the Länder level]. [For Burgenland,] there you have the law, Burgenländisches Raumplanungsgesetz [Spatial Planning Act]. Then, the zoning type which you need to build the wind power, the Grünfläche Windkraftanlage. Then, you have the law which is responsible for spatial planning, Land Development Program (LEP) 2011. Then, you have the zoning type which allows you to build wind turbines, the Regionales Rahmenkonzept für Windkraftanlagen. This is the strategic concept, the basis. Then, you have some notes and interpretations. Burgenland has the aim to

just renewable energy supplies. That is why they are the first one in Austria...Mr. [Gregori] Stanzer was working out this plan with colleagues from Burgenland. There, you have the other strategic documents used in other Länder. Like Carinthia has a Sachgebietsprogramm, a strategic paper for spatial planning, that says where you are allowed to build wind turbines. They just worked it out now in Lower Austria, and so on. It is an overview of where windkraft plays a role.

And Burgenland is from 2011.

Yes, it says Regional Framework for Wind Power.

Reviewing ÖREK (2011) Good Practices for Windkraftanlagen

Thinking about minimum and maximum distances away from nature preserves or Natura 2000 sites, who sets that? Is that regional too?

Regional. It is always done at Länder level. They do their strategies, their Rahmenkonzept für Windkraftanlagen, and in this concept they decide the distance. Also [included] is distance measurements from settlements, natural reserves, industry, and zoning.

Do you think it is helpful that a lot of work is done at the regional level? Do you think it would be more effective if anything was done nationally? For example, to identify wilderness areas, conservation areas, or watersheds at a national level.

You have to take into account the [bureaucratic] competences. You have to take into account, for example, the line infrastructure planning. There are competences at [the] national and regional level. Then you have to take into account something like naturschutz [conservation], nature preserves, done at Länder level. There are other spatial planning laws. The nature planning laws come from sectoral laws at the regional level. It's always agricultural things, nature preserve things, and others laws. You have to take them into account when doing these plans. You have to take into account a lot of different things, and most of them lie at Länder level. What I think is lacking is something like a national framework for renewable energy [spatial] policy. We do not have a politically approved national framework for renewable energy supply. Where it says, for example, 'Austria wants to use a lot of renewable energy. There are the zones where this or that would be fine to use because you have water, you have wind, you have sun.' It's not decided at the national level where it would be fine to use which thing. Even there is lacking a national strategy what should be done. I think that is lacking. Strategy at national level is lacking.

That is what I was thinking too. It would be helpful to know spatially. Like you said, it is a matter of competency.

Yes. I think it should be worked by the Federal Ministry of Science, Research, and Economy because they are responsible for energy. In my opinion, they are responsible for such a national framework or a national strategy. They tried to work it out they didn't approve. They have to coordinate this and check it with the Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management. This is also a very important ministry because they have

the climate change laws and climate change responsibilities to be worked out. So at a national level, those ministries should work together. They try but yeah.

Because we discussed the wind atlas and nature preserves, I want to ask about soil for development and a suitability analysis. Is that a consideration done at this level.

Soil is a very complex theme in Austria. In other countries, it seems to be easier to get information about soil. Even we at the national coordination unit for spatial planning, we are really, let's say, fighting for data about soil and land use for this or that. It's really difficult. I don't know why. It has always been so. Unfortunately, the open government data strategy comes like a wave, and hopefully things are getting better. But information about soil, we do not have open data. I noted it down and can give you links. Generally, the information lies within the Länder based on the spatial planning laws and the zoning plans, information where they have building land and the green land. Also at the Länder level, they have information on nature reserves. The GIS departments have everything but not everything is open data. Interesting things are not open data.

Appendix G

Interview with Reinhard Pitzer
Managing Director
Püspök Group - PK Wind Farm Management GmbH

December 3, 2014

Can you tell me about you and your company? How long you have been around?

Two years ago, I joined the Püspök Group as a managing director, along with two other managing directors who are in the family. It is a family-owned business. Before I joined, this company already had 25 turbines running in Burgenland and another 60 turbines in construction. They needed support from the managing side to spread the responsibilities among different persons. The team is quite small. We are only nine people. Compared to other companies that are much bigger and have the same capacity of wind turbines as us. We are very small and trying to work around everything, and trying to outsource everything that is not necessary for us to do ourselves. This is our main business. Our only business currently is the project development, the construction, and the operation of the wind turbines, currently in Burgenland but also in other regions of Austria. Mainly, in Lower Austria. This is the federal state with the largest potential because of its area. It's the largest state to build wind turbines.

My current responsibility is the project development. I am responsible for everything, like acquisition of land, acquisition of municipalities, the coordination of the permitting process, everything which is around that is necessary to get the turbine permitted and then to prepare for the construction phase. Also, the negotiation of contracts with manufacturers, etc. We are small so we don't have diversification among the people. We do it ourselves. This is the business Püspök Group is working in. We are also still in the process of developing new projects and thinking about the repowering of old projects. This is currently very very important for us to focus on. Let's see what the next years bring. The atmosphere in the field of business was never that stable in Austria. It was always kind of a "hop on, hop off situation." A lot depended on the incentives given by the Austrian state, as it is in every other state. Here, we had quite an unstable situation. We had a feed-in tariff for one year but then didn't know what happens the next year. You didn't know which investment you should take in the project development. That has changed in the past two years, where the government decided to fix the conditions for two years. But at the end of next year [2015], we are in the same situation again where we don't know what happens next. You change some regulations, which make life a little easier, so we are expecting some difficulties in the coming years…We have to see. Together with the wind association [IG Windkraft], we have to fight for the rights of the wind turbine project developers. That's the short story about myself and my company.

We are currently operating 85 – 90 wind turbines in Burgenland. We are supporting or servicing 5 wind turbines in Hungry, close to the border, which are from 2003 or so. We are on our way to more than 100 turbines, but that the fast-growth that we have had so far. It's more of an organic growth that we are now having, rather than the explosive growth that we have had for the past two years.

Can you provide a brief overview of the steps involved in establishing a wind farm in Burgenland (ex. certificates needed, wind measurement, permits, the environmental conditions that must be fulfilled, etc.)?

What is necessary to have wind farm permitted in Burgenland, it's only a little bit different than other federal states. Let's say Burgenland is the situation. It is two different permitting procedures. First is the zoning. Second is, in most cases, the Environmental Impact Assessment. The projects are that big, with more than 20 MW size or 20 turbines with more than 500 kW. That's the threshold we have for the Environmental Impact Assessment. In most cases, we have to proceed [through] such an Environmental Impact Assessment. That is of course including all the experts and analysis that are necessary to have such a project evaluated. Within the Environmental Impact Assessment procedure, you have the regional government that is leading the procedure. It has twenty experts, sitting inside the government or outside because there are not the right people in the government. They are coming from outside. They are the experts for the government. They are delivering analysis or studies for each of their fields, like electro-technical, construction, sound, shadow, and so on. Those fields are covered by different persons. Those persons are delivering their studies. Those studies all together form the permit with all the requirements that they oblige us to do and abide by.

Getting back to zoning, what you need is, in Burgenland and Austria...the first step is the suitability zones, which is nowadays necessary. It's not a public procedure. It is more or less a decision taken by the regional government. Which region? Which area? Which field is suitable for the development and the operation of wind farms? This is the first step that is taken, with the cooperation of BirdLife, spatial planners, and different stakeholders which are participating in this procedure and this discussion. Already, they have a first serious picture of what is really possible. Otherwise, it is just the regional government saying, "Here or there you could try to develop wind farms." This wouldn't make sense and wouldn't be serious, so they are involving BirdLife. They say, "BirdLife, tell us where the birds fly and that is where you have the restrictions. BirdLife says, "Here, want to have this flight corridor, and so on." In the end, it's always a little fight. We participate in it because we wish to have this or that area covered and they don't. In the end, it's a mutual decision making process. Then, the decision is taken by the regional government. But we try to do whatever we can to get out to get our project fields into the suitability zone. Once you are in the suitability zone, it is of course not a guarantee to have the projects permitted but it is a good guess to have them finally permitted. The first step you then take is to make an arrangement with the municipality which is concerned by the real estate for the turbines. Because, it is the municipality which has to file the application for the zoning to the regional government. It's not us as the operator or the developer; it's the municipality that has to file this application. They, of course, have to agree to do all things you want to do as a project developer. They have to agree with the positions of the turbines, such as the distance

from the turbines to the municipality, and so on. Everything which we want to do, they have to agree to. This is the step of the zoning that the municipality is taking a report, which is drafted by us and our engineers who deliver the report, and the municipality takes its application to the regional government for the zoning. Once this happens, you have your time frames of how long you have to wait and how long it this has to be made public where people can make their claims against the project. Finally, the zoning ends with a certain event that takes place four times a year. It is an organized institution put together which is put together by the federal government, the people who decide the zoning. The people meet four times a year. Within this meeting, the permit the zoning for this and that project, housing, wind farms, and so on.

Once the zoning permit has taken place, we can go on with the preparation of the EIA documentation, which is quite big as you have to cover, let's say twenty, different fields of the project. All the expert fields that have to be analyzed by the people in the regional government. And finally to evaluate if the project is permitable or not, and what is necessary to make it permitable and which requirements they ask us to additionally take on to make it permitable. This is the procedure…the zoning procedure takes about 3 – 4 months and the EIA itself takes around 1 year to prepare everything, to have it sorted out by all the experts, if the documentation is complete. If the documentation is complete, then they have to confirm. A period of a few weeks starts where they have time to make their analyses and studies. Then after they deliver the studies. In the end, it is a kind of decision of the studies. If you have any claims from the public or NGOs, which can also make a claim within the EIA, then there has to be a public negotiation. If there is no claim, normally the experts of the regional government say "This and that have to be changed a little bit." Then, it's a discussion with them but no public negotiation. Of course you have to make it public in any case, but there is no negotiation where the people can negotiate with some landowners, with NGOs, etc. about the permitting of the turbine. This is the short version of the permitting process.

Finally, what is necessary, as soon as you have the EIA permit, this is not the end of course. It is the start of the next phase. You have to file an application for the feed-in tariff grant at a certain institution, OeMAG, which is basically the central institution that is giving out the contracts and having in the background its contract with the utilities. This is basically the end of the project development. After that, you have to wait until you have received the contract. When you file an application until this or that date, you are supposed to know which promotional scheme of the feed-in tariff you fall under. If I file the application until the end of December, then my tariff should be this or that. The only thing you have to wait for is the contract supplied by OeMAG. This is a question of what the volume of the promotion is given by the Austrian state. Unlike in Germany, Austria is limiting the volumes of promotion for renewable energy. If you apply within this portfolio, within this volume, you receive the contract earlier. If you are not within this volume, you are going to have to wait until maybe next year. You have to wait until the project is, more or less, economically feasible. First, feasible from the permission point of view. Then, you have to wait until it is economically feasible. Of course, then the financing structure and negotiation with manufacturers (road, cable companies, etc.) until you make the project complete. Then, you can start construction. This would be the permitting phase of this project.

As you noted, wind measurement is definitely something important. In Europe, banks ask for at least one complete year of wind measurement. Of course, more would be better because one

year can be different to the next. Even though they have to take the long-term view of 20, 30, 50 years, whatever, of meteorological data is available. What we do is not always have a wind measurement because we have so many wind turbines that also deliver data. We take this data to also have a basis for our wind studies. This is also fine. There are other possibilities where you don't have to put up a 100m measurement tower for one year. You can take a LIDAR or sonar measurement for a few months, which is also representative and accepted by the banks. There are many different possibilities in the next years, but not right now, that are also certified by IEC and finally accepted by the industry. Currently, the industry only fully accepts, really, wind measurement masts of 100m or so. They are now working on a few different possibilities like LIDAR and sonar, and taking that into IC certification so that is officially also accepted.

What is IEC?

IEC is the International Electrotechnical Commission, a technical certification. An international standard. There is an Austrian norm, which is the norm of the international norm – IEC. There are many different IEC codes and standards necessary for wind measurements.

Which phase does the wind measurement fall under?

Basically, it should happen after a certain point in time when you should be sure that permitting is somehow possible. Otherwise, you don't take €100,000 – €200,000 for the measurements. This is of course a high investment to get the wind data. Of course, this has to be based on some proper decision or some proper basis that you know to have the permitting. You have the suitability zone, the zoning, the EIA, and there are no real knockout criteria, which you of all have to sort out. All the suitability zones are outside of any knockout criteria. Even if you are in the suitability zone, you have to check if there are any knockout criteria where it may not be possible or suitable for a wind turbine even though it is in a suitability zone. This the error the some people has. Not all things can be checked when you fix the suitability zone. There are many things that are not checked. They come up in the EIA or the zoning process and might be surprised that it comes up. Basically, you have to see that the suitability zone is very positive because it is sorting out at a time before the real work starts. You know where to start and not to go anywhere you think it is impossible to plan any wind farm.

So the suitability zones are controlled by the Burgenland government.

Yes, they are controlled by the federal [state] government. There is not national decision making about this because this is a regional thing. This is decided or determined by the people who know the situation and not by any national government that would just ask people from the area.

Do you think there are enough suitability zones currently? Should there be more?

Well, of course if you ask a wind farm developer, there can never be enough wind farms. With regards to Burgenland, there are already many turbines and the area is already quite full of turbines. A certain area in the north of Burgenland. Unfortunately, in the south or the center of Burgenland, there is no real wind and so you cannot really install turbines there. Lower Austria has quite a high potential for suitability zones. There, there is definitely not enough suitability

zones but this has also to do with the political interest. In Burgenland, you have the federal governor who is interested in this topic. It is his topic. He is the leader of this topic. In Lower Austria, the federal governor is not interested in it. He is sending his people there. He is not really interested in it. It is not his topic. Wind power or renewable energy is not his topic. The political support is very important. If you only send your assistant there, it is not the same as going there yourself as the head of the federal state.

Which state regulations are the most influential in developing wind farms? Are there any relevant municipal regulations for wind farm zoning?

The state regulations that are definitely influential or mostly influential, I would say, is for a legally stable standard which is definitely here in Austria, and countries like the US for example. You don't have to fear that as soon as you start developing a project or having it permitted, anything very extreme happens so that your project can never be realized which can happen in other countries like Spain. It's not like Spain is quite an unstable country but it happened because of the economic crisis. Or countries like Bulgaria, the Czech Republic, all those countries that were highly in the economic crisis. But it didn't happen in Germany, so far. It hasn't happened in Austria. Best guess is, of course, that it will never happen. It is legally stable.

Of course, the two most important are the feed-in tariff, the promotion regime of the country, and this is currently stable here in Austria as well as Germany, even though the next years will bring destabilization at least for private companies and not for utilities, I think. For private companies definitely, because the trend is going to more market-oriented sale of electricity and not the fixed tariff system. [This] is kind of an unfair approach because the market has so much promoted fossil fuels and nuclear energy by the states, the EU, and all the institutions. They couldn't afford themselves to run on market basis. What they do is highly promote it with lots of money, billions of Euros. This is what distracts the market a little bit.

People tend to say that wind power is expensive because, say, it costs 9 – 9.5 €¢/kWh, and the market price is 3.5 €¢/kWh. However, no other technology like nuclear, fossil fuels, or thermal power would never ever survive with this market situation right now. So wind power would. If there was no promotion in the market, prices would rise and wind power would be feasible without any promotion. Other technologies would, from my point of view, not. You know about the promotion of the nuclear power plant in Britain? I don t know if it is already finalized. Britain wants to build a large nuclear power plant and promote it for 35 years with a fixed and index tariff of more than 10 €¢/kWh…This is more than what I would dream of for wind energy. At fixed terms, they are promoting nuclear power. They don't have any hydropower like we do in Austria. I suppose it's very difficult to then compare and say who can afford to run a business. So, the feed-in tariffs and the promotion system is very important. Of course, what goes together with the system is the preference of the renewable energy. The renewable energy has to be taken off before any other energy or electricity generated from other technologies. That is the advantage we have and benefit from. The utilities first have to take us, and then the gas, oil, and other energy forms. Basically, that is the most important thing. Stable framework. Stable environment. Stable economic conditions like the feed-in tariff. And the preferential offtake. That is basically what drives the project development.

Even though it is changing at the end of next year [2015], it is still going to be okay? Will it influence utilities more than wind?

I suppose so. Everything is going away from fixed promotion systems to flexible or market-oriented systems. Of course, it is difficult for banks to assess if a project will be feasible over the next 10 – 15 years, which is in the financing period. That is, of course, the most difficult thing as the investor. How can you assess without having the other possibilities to sell the electricity like the utilities do? To have any economic package. This is very difficult, if not to say impossible. This will definitely prefer the utilities, which have the possibility to sell here and there the energy at other prices, than we do. It's going to be very difficult for us in the future if things change to the new system. To a public tender system, more or less, like what they have in Brazil. The public tenders…the utilities are the responsible institution for publishing tenders. They say, "I want to buy this or that volume of kWh. Please offer." Then, of course, the lowest offer wins. You have to check what your marginal prices are, and go down as far as possible to make your project feasible…We say, from past experience, what we gained…we as the entire Europe or world…we experienced that systems like this, the public tenders do not lead to the same result or same success as the fixed tariff systems do. The argument is also that, from the other side, the fixed system does not lead to technological changes and development. It tends to do the same thing because they are not motivated or have an incentive to improve. They stay at the same level and do not improve. Improving is, basically, the basis of incentive systems. They don't want you to stay the same. They want you to improve so that you will be able to work at market-prices. That is what every incentive does.

Which stakeholders have been most influential in encouraging wind farm development in Burgenland? Which stakeholders have slowed or limited development? How have local politics helped or hindered wind development?

As I said, it's different in Burgenland than other federal states where you have the head of the federal government who is the leading guy for this issue. He is saying, "I want to be energy independent from the outside." Even though that is not correct. "I want to have 100% production of renewable energy in my state, which is the same amount the my people and industries use." Even if you miss the link of energy storage, because you have to send the energy around and to foreign countries, it's not correct. But at least it is a kind of message. It's a message to the people. It's a message to us. "I want this and that is what makes my success." Due to this support by the head of the federal government, the people below him working in the government and responsible for evaluating and assessing the project, responsible for permitting the project, of course they have a high motivation. When their boss says, "This is great. Let's do it," they also follow this motivation and be faster, quicker, more efficient, and so. What we experienced in the past in our federal state is that permitting time has reduced from, let's say, five years in the past to maybe a little more than one year. In the past, this was not there. Now, it is there and the people are there, and know what to do, what to ask, what to look at. It takes around one year. This is one side, the federal state. Of course, it is necessary to have the local mayor also behind you. But this definitely the fact as soon as you start a project. One of the first steps you do is address the local mayor of the municipality, and you make an arrangement with him. This is the starting point for each project. You have to have the landowners and the mayor

behind you, and the suitability zone of course, and if you have this packed together, you can start project development. And, of course, then you have the backing from the federal state, from the municipality, from the NGOs (at least, basically from BirdLife for the suitability zone side). This is a good basis to start development. Basically, that is more or less the answer to the question. Of course, in other regions it is more difficult. You have to work more, there are more people against wind farms because they see there is not the support from the top. They see that it is possible to say "no" and to ask the local mayor to make a public voting procedure…this can kill a project, definitely. Fortunately, this does not happen in Burgenland because the support is there from the political side and also the support from the people. They see it as something positive. They think Fukushima, two or three years ago. They remember and argue that it is better to have wind turbines than nuclear power plants, or fossil fuel plants, or thermal plants. That is the advantage that we have in our region. We have both support from the political side and the population. This is very positive. We of course try not to break this positive atmosphere. It can, of course, if you do too much. This is reduced by people within the regional government. The people that are responsible for environmental issues. Of course, they step on the brakes and say, "Yes, I like wind turbines but we have to slow down a little bit. We have to make less here and there to not infuriate the people." If you do that, the federal government loses the backing. This is nothing they really want.

What is the extent of communication with the public? What is the extent of decision making with the public? What does the land general leasing process look like? Does wind farm development primarily occur through private agreements with one property owner or with multiple property owners? Are public lands available and used?

The general leasing process is two ways. The first one is to go to the municipality and address the mayor. "Let's do this together. We need the municipality for the application for the zoning." It is a question because they are providing public lands. The roads that are used for the transport and also for the cabling to the substation for the utility. The process is either first you go to the mayor and say, "Please let's do it." Then, he gives the green light or the municipality council gives the green light and you can go ahead. Unfortunately, development in Austria has made things necessary to do it the other way around. Once you have addressed the mayor, others may have already addressed the landowners. First you address the landowners and create a project, and address the mayor with this project. "We have a project with 5 – 10 turbines situated like this. We want to do it together with you. Let's make an arrangement." This is how the procedure looks like.

In regards to the negotiation with the landowners, we have our contract form (which is not fixed and can negotiate here and there a little bit). We tend to say that this is what we have used in the past, gone into practice, and what works. We try to convince the people that this is fine and okay. Also, all of the conditions within the contract are fine up to the market. Let's say 95% tend to think this is okay and close this contract together with us. We are approaching every single landowner not in a group but individually. If you do it in a group, there are advantages and disadvantages. Depends on the experience of the people. If you go to a region where nobody has any experience with wind farms, then it might be more helpful to have a meeting with the entire group of landowners and tell them what you want to do. Present them the contacts and then have them sign the contracts directly at the meeting. However, as soon as

people know how things work, it is better to address everyone individually. Going further through the public communication process, it depends on the political support and support of the population. The higher the support from these two sides, the lower communication is outside of one or the other next project. In other federal states like Lower Austria, the requirements for public communication are much much higher. People want to know. People want to have this presented before anything happens, before the municipality council decides, etc. They want to have a public vote about the project, and so on. This depends on the level of acceptance in each different region. There is no standard recipe for communication. You have to adjust to wherever you are. This is no secret. This is basically true for every single field of business…Kinds of communication like stuff in the newspaper. But, we have never had any public meeting where we invited hundreds of people where we presented what we want to do. This has not happened so far in our company and even in Burgenland, I think. Of course, afterwards, as soon as you have the wind farm in operation, people are invited to see it and feel it and to not be scared of it. People often have some fears that have no basis. You have to take away those worries.

You asked if we would rather go to large owners or small owners. Of course, it is easier to address the large property owners first which is definitely done if they are within suitability zones. But, of course, it is necessary to check with the Geographic Information System (GIS) where are the big owners and where are the small owners. The small [land owners] ones have one [land] stripe after another different, and the big [land owners] ones have a field where he is growing the same thing. So you see that this is belonging together as one owner. This can easily be seen on the GIS. However, our company currently doesn't have any large property owners. Only, small to medium [sized] property owners that are going from, let's say, one turbine per real estate plot to one turbine on ten different real estate plots. You have to cover the entire area of the rotor blade so you need hundred-plus meters and sometimes real estate plots only have a width of 10 – 15 meters. You have to secure more. We have the range of 1 – 10 [plots] per turbine.

Since we are on the topic, for grid connection points and the underground cables, is that also negotiated with landowners as you go through their property?

Yes, but only as long as you go through their property. This is one contract covering the construction of the turbines, the plots themselves, the areas before the turbines, the cables, the right to use the land with lorries or trucks. Everything has to be covered within this one contract. The rest of the way to the public grid is then mainly contracted with the municipality because we are using public roads, which are in the hands of the municipalities. They have to give us the same contract, more or less, as the landowners. We are going through the roads, wherever they go, until we reach the utility substation. Then, within this area, you need another contract with the utility itself because all of this belongs to the them. And the substation has to be co-financed by us.

You follow the roads because next to the road you can easily dig? Also, it's just one customer basically.

It's one customer and it wouldn't make sense. You would never be successful asking 100 landowners to cut through their property.

Is eminent domain ever a factor in the process?

I think not so far. Eminent domain is taking land by force. I think that happened when they build the motorway. It hasn't happened so far in wind energy. Wind energy is a public interest but still in private hands. We cannot ask the federal government, "Hey, this guy is not giving me this or that contract or these conditions. Please take away the land from him."

And for the cabling aspect?

It could happen. I think it already happened for one instance when you have to go through a certain land belonging to a certain municipality, and this municipality is objecting to the project. Even if it is five meters, you have to get it. So, it could happen. I think it has happened in Austria, not Burgenland, that this right to go through this land has taken by force through eminent domain. If it is in the national interest, then this can happen. But this is not a motorway. This is a cable going through the ground. Most of the time, it is a financial background which they would like to address. The other municipality who doesn't have the turbine and it's difficult for them. Sometimes people are trying whatever they can to use the pressure. You always have to find a consensual way, but if you can't and things are going out of the framework, you have to use these extreme measures. I hope it will never happen my projects ever. I think we always find consensus with the stakeholders to complete our project. Hopefully this will go on like that.

In what ways does wind farm development adhere to spatial planning regulations?

Yes, of course we have to abide by the spatial planning regulations. First, the suitability zones are products of the spatial planning regulations, which is analyzing the distance to the municipalities. There has to be a certain minimum distance to the municipality. There has to be a certain landscape conservation, saying the turbine must not be higher than this or that. In other regions there are no height restrictions, but in our region there is. Not higher than 150 m or 160 m. So, in the best of all cases we have a certain picture of the turbines. That's what they want. This is part of zoning and the spatial planning. As soon as you come to the zoning procedure, then you have to abide by those [spatial planning] rules. How municipality asks the regional government for zoning with things in the application like project description, etc. Then, until the environmental impact assessment takes place. The people responsible for the zoning within the government are following the zoning procedures and the environmental impact assessment procedures. They are checking every step you take so the project abides by spatial planning rules. There are certain regulations but it would be too far to go into specific detail. The most important one is the distance to the private house zoning. This is the most important because you have to be away from sounds, shadows, etc. This is fine for us so we know how far we can go. You can check the Regional Development Program of 2011. It's the bible of spatial planning regulation in Burgenland.

How does the location of grid connection points influence the development of wind farms in Burgenland?

It definitely does. However, it is a special case in Burgenland. The usual way of siting is as close as possible to the grid access, definitely. You want to be below between 5 – 10 km of cable, or 1 km in best case but it is never possible. In Burgenland for our project, the last phase of development for our wind farm project was that intensive and was that big that so many turbines were the basis of the permitting process. We sat together with the utility. In Burgenland, Energie Burgenland is the utility on one side. On the other side, they are the largest wind farm operator in Austria. It was their interest to have something [a substation] there. We sat together with them and a handful of developers, and asked them how we can find a way to get the electricity to the grid. They found a way by permitting themselves for constructing two substations. This was a special case for that project because it was so big. But it's not really a special case. I know it from Romania, where you have to develop the wind farm, and for the utility the substation. Then, more or less, give it to the utility without any payment so that you can get into the grid. It's basically the same here in Austria even though we have to pay a certain amount of money per MW, which is currently around €100,000 per MW, which is then used for the construction of these substations. That's basically the way it was done in Burgenland, and now these substations serve as the center for wind farm integration into the grid. This has been set up as the basis. In Lower Austria and the larger federal states, things are different. You have different grid access points and different locations. Sometimes 20 kV, sometimes 110 kV, sometimes 33 kV is the grid access level. Each developer has to check what the situation is and see how he can get into the grid. It is more of an individual kind of solution than this big solution that we had in Burgenland. This was a special situation that we had. In any case, I think it was the best way to solve it. Otherwise, you have to see where the next [network connection] point is. "10 km away, is the substation equipped well enough or not?" Then, you have to talk to the utility. "What do I have to do? Do I have to equip this or that more in the substation?" That's a matter of money and price. Also, I think the acceptance is better in regards to Burgenland because, Energie Burgenland is the largest wind farm developer, the acceptance of the grid by the utilities is higher than maybe other federal states. It is the fact that wind turbines are a kind of challenge for utilities because they are not that stable. They are coming whenever the wind blows. They have to make a prognosis but then how to check that. It is more difficult then to just switch on a gas power plant or just switch on a hydropower plant. It's much more difficult, but it is feasible and it is no problem actually. Definitely, it requires negotiations with them. They are not giving you any presents or gifts. You have to make the negotiation about the grid connection contracts, etc.

Is the relationship difficult with Netz Burgenland because they also are a separate wind developer company [Energie Burgenland Windkraft]?

Officially, they are an unbundled company so they must never prefer their sister company. However, of course, it happens in life. Of course, then you have to work together with the sister company. It makes things easier. If you cooperate with the sister company in the group, then it makes life definitely easier. In this case, it was definitely like that. They had wind farms and we had wind farms. We got together and had all of the price synergies together. It was an advantage for them as a group, not for them as Netz Burgenland because it was work for them and more stress to do. The national interest was there. The political interest was there.

Is the transmission line a factor in wind farm development takes place? It's mostly about

the substation, right?

Not only. If you look at development in Germany, there you see the transmission lines are definitely a big factor. I don't want to say they forgot to make the parallel development of the transmission lines, but they just didn't have it in focus. What was in focus was wind farms, wind farms, wind farms, and photovoltaic plants, etc. Many GW of energy in the north and many GW of solar energy in the south, but no connection in between. "How can I get the energy from the sun to the north, and how to get the energy of the wind to south?" Now they are working on it but the procedure for the transmission lines takes 10 years. Because there are so many people against the transmission lines, like against the wind farms, but even more against the transmission lines. All of the public procedures with hundreds of claims have to be worked through until you have the final permit and can build the transmission line. It's very very difficult and the Germans will have quite many problems in the next years to come up with this transmission line connection.

In Austria, you also have this situation that people claim against transmission line permitting. But, the transmission lines themselves are still stable for this extent of wind turbines, this extent of energy in the grid. Austria is still stable. Germany is stable too but getting unstable because wind turbines are pushing into the market. It's a structuring of the entire system. It's not just looking at wind turbines and looking at the grid. It's a structuring of how can I get the wind turbines to also function as a kind of compensation of energy in the grid. If there is too much energy, switch them off. If there is not enough…this is not really working for wind energy…if you switch them, this could help the grid again. There is already a system of payment for this switching off, which doesn't exist in Austria. If we have to switch off, this is lost money. In Germany, as long as the turbines are technically equipped, you have this possibility to sell lost energy. To get money for lost energy. To be compensated because it is a damage. In Austria, you don't get any damages for lost energy. Currently, a stable situation. The transmission grid operator is working on the development of the grid and has plans until 2030. They are working on it. They are working on the stabilization of the grid so we should not have any issues with wind energy. In Germany, they will also have solutions. They are always the head of technology development. They will also come up with solutions there.

How might energy storage influence wind farm development and siting?

Of course it could influence the construction of wind farms. But currently the development of the storage is so far away from being marketable. Currently, it is no issue. I think it is, rather, an issue for private households to have their own electricity production on the rooftop, small turbine, whatever, and have it stored in their cellar underground so that you have your own energy. This is what my dream is to make it happen in my home. In the big business, I think it is still far away from being realized because people still don't know what is the real storage. Is it chemical storage? Is it water or hydropower? What is the storage? I think they are still working on what the final solution for storage could be. It is going to be, maybe, the most important topic in the future because we already have our renewable energy realized. We know that it works. We can prove it. This is business we know. Storage is still in research and development. I think they have to work on that. That is going to be the future.

What does the future of wind power look like in Burgenland and in Austria?

The future of wind power in Burgenland is going to be a rather stabilization of things. We will have the final construction phases in the next coming years. Let's say until 2017 or 2018 when the next permitting phase has ended and the next construction phase starts. Until 2018, we will have some more wind turbines there. We will have some repower turbines there. After that, I think we are quite saturated with turbines in Burgenland. However, in Lower Austria, a bigger place to have wind turbines, there will be some more development because Austria has some targets. 3 – 4 GW of wind power. This target is still not fulfilled. They have to work on that in Lower Austria. In the other regions, it is more mountainous and it is more difficult. They will come also in smaller amounts, but they will also participate in this renewable energy business. It doesn't look that positive but I think so far we have done a lot. We have to stabilize ourselves. We are finalizing the construction here and there, and finally getting into the operations. We have time to stabilize our own business here. Up until now, everything was important to have permitted, commissioned, and constructed. But the money comes from the operation. Everything you do in the operation phase helps to produce more kWh, which helps to have fewer standstills of the turbines, will of course help you have a higher profit. This is something that we are now in. This is the phase we are now working in for most of our turbines. To improve, optimize, maximize the output, which is the most important for the next 10 – 15 years or as long as the financing period is running. After that, as soon as the financing period is over, where the real profit should start. Then, of course, you have to look even more at the outcome of the wind farm. It is going to be a lot of work for our small team.

Appendix G

Interview with Patrick Scherhaufer
TransWind Research Project
Institute of Forest, Environmental, and Natural Resource Policy
University of Natural Resources and Life Sciences, Vienna (BOKU)

December 5, 2014

I would like to know about the TransWind project. How did it start? Where is it now? Where is it going?

It started 2 - 3 years ago when tried get some funds from the Austrian Climate and Energy Fund. We had luck and got some money for it. About €230,000. It is based on an interdisciplinary team with different experts, but all located at the University. I am a political scientists and I am much interested in stakeholder integration, how could you integrate knowledge from non-scientists into research. I am doing a lot about participation and democracy. The other guys in my team...they are more experts in economics. They are modeling. They are trying to model the wind potential in Austria. You can see some of our results in the map. These colleagues, in the second step of our project, try to do some visualization with the 3D environment. They try to put wind farms in the landscape, and then we could be able to discuss with the local people about their reaction. Our plan is to go into small villages in Austria, but there should be no wind farm already installed or there should not be any plans there. So we try to go into areas more in the western part of Austria where you have landscapes which are more vulnerable, I would say, and where tourism plays a major role. Summer and winter tourism. We started with the triangle described in the literature by Ralf Wüstenhagen, a Swiss colleague. He tries to explain how wind energy could be socially accepted. Our starting point is that social acceptance is dependent on three determinants: the social-political acceptance, the local acceptance, and the economical acceptance. We tried to use this as a starting point and said, "Maybe it is not enough to describe the specific Austrian situation. Maybe you have more variables or determinants that should describe the social acceptance of wind energy." We are much more interested in ecological aspects and also in different landscapes. How do different landscapes influence the social acceptance of wind energy?

If we take the example of northern Burgenland, in the so-called Parndorfer Platte, where you have the windiest situations in Austria. It could be compared with the northern part of Germany by the sea coast, for example. People who live would say that they live in a nice landscape. They are used to it. But if you compare it with other parts of Austria, like the alpine region, they won't say that this landscape is a nice one or where they want to live. This is also

one of the advantages of the so-called “success story” of the situation in Burgenland. The spatial distribution of the villages is very coherent. You have a town or a village, and there are not so many buildings or small farms outside. In other Bundesländer in Austria, it's much more different. If you compare this to Salzburg or Styria or Tyrol and so on. This is one of the major advantages, although we have the nature conservation area with Lake Neusiedl. There are other factors, that we can discuss later on. The specifics of the situation in Burgenland.

For our project, we try deepen and widen this triangle on social acceptance. This is our major role. What is difficult in our project is that we try to integrate as much stakeholders as possible. Not only to integrate them, but they have be formed in a so-called "reference group" from the beginning. We ask at the first hand, "Who could be an interested stakeholder in our project?" We asked about 60 - 70 people and we just numbered their response. The organizations or institutions who got the most numbers, we invited into our project. And say, "This is the reference group. You should take part in our project from the beginning to the end." We say how they could influence our research. For example, we ask them about our case studies. "Are these the right case studies or should we take other ones?" We ask them about factors about social acceptance. I interviewed all of them, and so on. It's not only an advisory board or something like this. It's more.

The problem is that you have organizations like IG Windkraft, Energie Burgenland, and other groups who should encourage our research, and then you have the more skeptical organizations and environmental groups in Austria. And local initiatives who are very skeptical about the situation now and how it is developed in Austria. To incorporate these groups into the research, it's not very easy. To try to balance their opinions. So we started not only to say, “Our aim is not to promote wind energy in Austria.” We rather argument it very defensively. “We respect these arguments and we respect the other arguments.” We try to include all of them in our research. It's always in the balancing task. That's my main business, I would say, in this project.

The end is open. I think we could bring our arguments forward. How to plan wind farms better. How to involve people better in local communities. But, we also could say, at the end, that in some parts of Austria it's not a good idea to explore wind energy. Maybe you could explore other energy forms but not wind energy because of the influence in how people perceive the landscape is very sensitive. This is a very broad picture.

How does the zoning of certain zones influenced social acceptance and public opinion?

Well, you have to differentiate between public opinion and social acceptance. We are not interested in public opinion. For example, the wind association does a lot in public service. You ask people in a quantitative way, "Do you like this? Do you not like this?" And so on. What is also very good explored in the literature is the so-called Not In My Back Yard (NIMBY) effect. We are not interested in doing much with NIMBY because it doesn't explain anything. It just explains that people are opposing wind farms, but they do not ask for the reason behind this perception. We didn't do any survey in our project. Social acceptance is, I think...If you want to explain social acceptance, you have to go much more deeper. We try to do this in the case studies, as I mentioned before, with the visualization of wind farms, and, for example, focus groups. Then, you can see how people can get convinced about certain issues if you talk

about CO2 reduction, or climate-friendly behavior, or whatever. Or you can convince people. There are some cases in Austria where the village or the small towns are the owners of the wind farms. I would say, this is more promising than always talking about NIMBY. In fact, it's already well done, or very good described in the literature, and also very well criticized in the literature.

Regarding the zoning...With our map, there is one layer where you can turn on or off the zoning of different Bundesländer. The zoning is already done in Lower Austria, Upper Austria, Styria, and Burgenland. And Carinthia, but that's not zoning. It's a crazy law, I would say. The potential in Carinthia is very low because of that. We didn't want to double this zoning in our project, so we asked our stakeholders in a small survey. We are 28 institutions in our project. Taking the response from the stakeholders. "Should different areas be excluded or included to have potential for wind farms or not?" We asked them about different landscapes. How far should the wind farms be situated from villages and so on. We put this data together and created our map for the wind potentials. Because the zoning in Austria is so different. Two weeks ago, a young student finalized his Master's thesis and was just concentrating on this zoning...We don't want to integrate the policy about zoning into our research. It's relevant, but we think there is a lot of potential to change this zoning. I think in four years, the situation, especially in Lower Austria and Upper Austria, will be much different. It's a framework for how you can develop wind energy at the moment. Our opinion is there will be a lot of development, changes in the zoning, or potentially everything for wind farms are implemented. The zoning, for example in Lower Austria...they just excluded some areas, like the southwestern parts of Lower Austria, from the beginning. There was no argument to just research this in more detail. They were just saying, “Okay, this is our alpine area it is just out of [consideration].” We think this is not a good idea because you have...Maybe you read this paper about the grid system and the distribution of electricity in Austria. If you have more wind farms, more or less, dispersed in Austria, it could bring some advantages of getting more independent from other energy imports and to use the Austrian grid system better. To not do everything in the eastern part, like it is now, but to use your potentials in other ares, in more western areas. So this student wrote his Master's thesis only about the zoning. He has done a policy analysis. The recommendations out of the Master's thesis are a bit weak because...For example, in the situation in Burgenland, they already did the zoning in 2002, or started with the zoning. They were a kind of leader in this situation. The other Bundesländer didn't have a look in the situation or how to have done this. Every Bundesländer does his own thing. It's difficult to compare these different policies.

We have been speaking about wind farms. I am also curious about the electrical grid, substations, and transmission lines. Is that integrated into your research? I see that APG is one of the TransWind stakeholders.

The grid system on the whole is fine for Austria. They [APG] try to build the 380 kV ring, but at the moment they can live with the existing grid system. There are no problems about it. They invested a lot in the eastern parts, especially regarding the development of wind energy. More or less, they are fine.

In Salzburg, they are working on a grid extension. Has that been a part of the social

acceptance discussions?

No...this would be it's own project. But it is very similar. You also have the landscape issue. We just proposed another project a few months ago, which is more or less concentrating on this issue. Compare the wind situation with the need for the energy grid system. You know something about the situation in Germany. How to distribute the energy from the north to the south. In Austria, maybe if the [wind] installations are getting more and more in the eastern parts, it could become a problem. But, they from APG say up to 2020 it won't be any problem. After that, maybe.

With sharing borders, that might be a chance to expand the transmission lines too.

We are in the European Union but I could have the chance to discover that the grid system is only discussed, only thought of in a national way. You have the European energy grid system. 3 – 4 weeks ago, we visited the main operations center of APG. You can see the whole of Europe and where the energy or electricity goes. The advantage of the German and the Austrian system is that they have many more resources compared to the Eastern countries. They have a very weak electricity system or grid system there. The problem is for Germany is if the wind blows a lot and there is a sunny day, they produce so much electricity that Poland and the Czech Republic have problems with the electricity coming from Germany. In Austria, you do not have this. There is a nice story about this. If there come a lot of solar or wind electricity from Germany, Austria increases the production of electricity because they do now want the electricity in their grid. They increase the national electricity production so that you can put something against it [German electricity], and then it goes to the grid system. We are the European Union but it is more thinking about national security about the grid system.

I would like to speak about Burgenland and public acceptance. I know it is early in the project, but what have you found so far?

I couldn't refer to our results because it is still to early. And we only want to take one example in Burgenland, focusing there on repowering. I did my Master's thesis about one wind farm in Burgenland, which was the first one in Austria, but that was twenty years ago...The situation in Burgenland is interesting because everyone would label it as a "success story." Not only the people responsible for the situation in Burgenland, but also other people, experts, whoever, representatives from other countries, and so on. I would say they have special circumstances which allow them to become a success story. One is the spatial distribution or the coherence of the villages. The second aspect is that they hadn't had any type of electricity production in Burgenland. There was the year of one of the main political parties in Burgenland and also the leader of the political party, the Landeshauptmann [Governor], to create a kind of political leadership and to say, "We want to produce electricity in Burgenland and we only have two opportunities. Wind in the northern parts and biomass in middle or southern parts of Burgenland." They also make it very explicit where they want to go. Which goals do they want to achieve up to 2012, 2014, or 2020. This strong political leadership behind was very helpful to discuss major conservation aspects, to discuss the influence on the landscape, or the influence on the people, noise or whatever. There is also a lot of trust, especially in Burgenland, about the party leader and the Landeshauptmann. In the end, it was a success story. It seemed to be that

everyone is satisfied with it. The situation now, maybe, is a bit more critical. Some people in Burgenland say, "We achieved all of our goals. Now stop it because it is getting too much." These are the major aspects of the success story. Strong political leadership, spatial coherence of the villages, and the aim of producing electricity and become independent. No one is independent but they can at least say this.

And that's what they are saying by claiming "100% self-sufficiency."

I think it was in May of this year [2014]. There were very stormy weather conditions in the eastern parts, but not too much that they had to turn them off. You can produce only with the wind farms in Burgenland and also on the border to Lower Austria. You can produce the demand of the electricity in Austria. Just with the wind farms.

And if you get storage involved, then there is even more potential. You mentioned repowering. That was definitely part of the conversation I had with Püspök Group and Energie Burgenland regarding their original wind farms. By reducing the total number of turbines and replacing a fraction of the wind farm with higher performing turbines, they were able to generate more energy. That also means bigger, higher turbines and a possible change in zoning. Is repowering a part of the TransWind conversation on public acceptance? Or is it just a general theme?

We shouldn't forget about the zoning. They tried to frame the issue very early in Burgenland. They started in 2002 or 2004 with the zoning. This was also very helpful for the success story. They tried to include a lot stakeholders into the zoning process. BirdLife and other environmental groups. Compared to the other Bundesländer in Austria, they [others] were too late. If you know the situation in Lower Austria, there was just so many wind farms installed and there was no zoning behind it. The government said we have to stop it. Then they tried to do this process of zoning within six months. This is too fast. In Burgenland, they tried to do it...I think the process was about two or three years. They tried to reinvent this zoning in 2008 - 2009. It is still now in issue, especially regarding the repowering.

The repowering is, I think, only a problem about the height of the wind turbine. As you said, they are getting more powerful but you do not need so many wind farms anymore. They are getting higher and higher. It's also a problem with the national park Neusiedler See - Seewinkel. In some ares, especially in northern Burgenland in the district of Neusiedl am See, you can only allow certain heights of wind farms. I think they are restricted to 120 m or so, or 140 m. This is difficult for the repowering issue. Repowering, I think, has a lot to do with business and making money. I think this is the major [force] behind pushing pressure on the political system, by saying we get more efficient and produce more electricity. We do not need to use 400 anymore. We can use 300.

One influence from the bigger turbines and for zoning might be the extra noise that is generated. It might be marginal but there is a threshold too. That could be something. You were saying how money is a big factor. I was thinking about the feed-in tariff, the length of these contracts, and the leasing, and how that might influence their decision to repower or not. That's a big factor because it ends next year.

This is still an issue because there is new regulation. One perspective is that you have to stop the feed-in tariffs. You can also read this legislation in this way that you can also prolong the feed-in tariff. I think it is a success story, especially in Germany. If you want to promote the renewable energy for feed-in tariffs, and there is a lot of papers discussing this, I think feed-in tariffs are a very good and helpful instrument in promoting renewables. The situation in Austria, if this feed-in tariff and how big this tariff will be is still a political issue. They tried to get into the old system, until the end of 2015. What is after 2015 is the negotiation.

Is the feed-in tariff influential for public acceptance? To know that money is being set aside for renewables. Obviously, a local context is important too. Is that in discussion?

I think the cost for individuals is always presented in the media. "How much do you have to pay for the increase of renewables?" Compared to Germany, the money you have to spend on it is much lower. You can say, in Austria, it is about, don't believe this but, €70 - 80 for a taxpayer. In Germany, I think it is €200 - 220. There are many organizations who are saying this costs too much. The subsidies going into nuclear, coal, and the other industries, I think there is much more going into these industries than renewables. It is always an issue in the media. Therefore, it is also an issue for social acceptance.

Is there anything we haven't discussed and you think is important to know?

One argument about the zoning and how they have done it in Burgenland, you have to analyze a very small area about how much noise is produced, is the wind farm located in the good [area] or not, is the landscape issue sensible or not, which animals live there. They are analyzing a small area in detail. Then, also finding a compromise between different stakes, issues, or perceptions...They won't say the animals are much more important than producing electricity, or whatever. Then finding compromises. You restrict the height of a wind farm up to 150 m, for example, and the potential is for 30 wind farms but you only build 12 of them. They tried to handle this issue in Burgenland very sensibly or sensitively. This is also one more argument for the success story. We are a bit criticized about producing our map, because it only shows you the broad picture. But we want to say something about the potential for Austria, and not for a small region or Bundesländer in Austria. We have to investigate each area in much more detail.

Appendix G

E-Mail Interview with Johannes Schmidt
TransWind Research Project
Institute for Sustainable Economic Development
University of Natural Resources and Life Sciences, Vienna (BOKU)

December 9 - 15, 2014

I understand that you are focusing on the electricity grid system and modeling approaches. What specific factors of the grid are you look into? Are there any case studies or major issues? Has any of this work focused on Burgenland? I understand APG is involved in TransWind as a stakeholder. How has the electricity grid system been included in broad stakeholder discussions? I would appreciate any information you can share with me on APG and the technological feasibility of the different possible spatial configurations for wind energy.

Thanks for your request - unfortunately I have to tell you that we are not working on electricity grid issues, but mainly on the techno-economic modeling of wind turbine deployment, i.e. with the help of a GIS, we assess the availability of land for wind power deployment (as derived from input in the TransWind stakeholder process) and use this data to subsequently generate supply curves for wind power, depending on the local physical wind resources derived from meteorological data and the Austrian wind atlas. We do so for the whole of Austria. We did not in particular focus on Burgenland.

As far as I'm informed, APG always stressed that our modeling approach is not sufficient to assess the technological feasibility of the different possible spatial configurations of wind energy because the transmission grid is not considered in the modeling process. Apart from that, the transmission grid wasn't a big issue in the stakeholder process.

In previous work, we also have assessed different policy options for subsidizing wind energy in Austria (see the attached paper).

Thank you for the response and for sharing the paper with me. I will look into it and let you know if I have further questions. I am doing similar work by using GIS to highlight wind power development in Burgenland, based on stakeholder conversations and spatial inputs. Regarding APG, did they offer to provide you with the transmission line data to include in the modeling process?

Nope, but we didn't ask for it as we are not able to handle such kind of data (i.e. we do not own transmission grid simulation software). In a new project, we try to assess grid issues too together with the University of Technology, however, we weren't informed yet if the project is going to be funded.

What specific concerns did they have?

As far as I understood, at the moment, there are no big issues with wind power production in Burgenland because Vienna is able to absorb most of it. However, if capacities are further expanded, it may be necessary to use pumped storage plants in the west of Austria to store wind power production from the East. This may cause additional stress on the grid. But I recommend talking to APG directly to get first-hand information on that issue. You may also try to talk to Michael Chochole (chochole@ea.tuwien.ac.at), he is involved in projects modeling the Austrian transmission grid.

Appendix G

Interview with Barbara Goby
Department of EU Environmental Policy and Environmental Law
Umweltdachverband

November 20, 2014

What are the greatest environmental and conservation threats from wind farm development in Austria or Burgenland?

We have worked on a position paper considering the aspects of environmentally friendly wind turbine building. What our position is that, in general, we say yes to wind farms but there are certain conditions. What our point is, and what is most crucial to us, is where it is located. The question of location of the wind farms. We have worked out criteria for certain 'no-go' areas. What we say is that the most crucial environmental aspects are concerning migratory birds and bats. What is also a big problem is the scenery, to protect the scenery and not to have the wind farms in central lines of sight. We say 'no-go' areas should be the nature protection areas concerning to the nature protection laws of the states of Austria. It is not a federal law, the nature protection law. We have nine states...and every state has its own nature protection law. There, there are nature protection areas nominated. Then, the national parks, like in Burgenland it is Neusiedler See–Seewinkel. Then, all the protected areas of Natura 2000...a European initiative. If you are talking about environmental law, most of the initiatives happen to be followed and coming from EU law. So, 90% of our law initiatives have its origins in European Union law. We have these two directives, the Bird Directive and the Habitat Directive. These areas should also be not the areas being first choice for wind farms. Then, there are also wilderness areas. In Tyrol, there are special rest areas where noise and such things are forbidden or not to be disturbed. Then, we have areas where biologists say, "Yes, they are important for bats," the corridors of migratory birds, also wetlands, protection areas of Ramsar Convention, UNESCO regions, nature parks, and locations of central lines of sight. We have certain criteria where it wouldn't be so good to have wind farms built, and which should be 'no-go' areas. What the big discussion is how to do it, where to set the borders of these areas, how to locate it, and how to find the protected areas. What is always the question is how to involve public, how to involved NGOs, citizen initiatives, and also the neighbors to the proposed wind farms. We have some good examples and some negative examples in Austria. One could say a good practice example is Burgenland. It is a good practice example on how to do it because they worked out a regional framework concept for wind farms. Also, they called us, we are involved and could give input. In other states, it didn't work so good. For example, Carinthia, Styria, or Upper Austria. In Lower Austria, we were also involved in it putting a regional framework concept, so a map of the state concerns. In collaboration with technical ecological bureaus, we worked out the areas which would be 'go' areas and areas which would be 'no-go' areas. We have these maps.

Are these public maps? Could I use that in a presentation?

I could give you the contact of the person who worked out these maps, from the technical bureau. You could call him.

You were saying that Burgenland had a good regional framework and that was helped by the recommendations that you had proposed.

Mostly by BirdLife. BirdLife gave most of the input on the migratory birds. We also have our biologists here concerned with Natura 2000 matters and biodiversity matters, giving their input. It was taken into account...If you want to build a wind farm, generally you can do it everywhere. You are making your plan, going to the authority, and the authority will accept it on a case-by-case basis. This can lead to...it is not coordinated then. What we suggest and what also European Union law directives suggest is that you do strategic planning. First, you are detecting which areas will be suitable and which are not. And in these areas you should concentrate your planning if you want to build a wind farm. It affords a certain change of mind, which is slowly coming up but it is taking very long to get it in the heads of people. We have it when it comes to urban planning and rural development matters. There we have the plans and there we have the zones, which are good and which not. When it comes to renewable energy infrastructure, we don't have it yet. It's now in the beginning to get something like a strategic plan. It's the same with hydropower. In Austria, most renewable energy is generated from hydropower because of the topographics of the alpine region...For the electricity gained from hydropower installations, it is about 60%. The rest is biomass. And then very, very, very, very little percentage, we get out of wind turbines. Burgenland in one of the states which puts most of its focus on wind turbines because hydrography is not topographically there.

You were saying that the planning is just not coordinated right now on a national level, and that leads to a lot of challenges. Right?

Yes.

Because you are a platform for 39 organizations and your mission is directly affected by wind farm development, what has been the role of your organization or your member organizations in the planning and development process? You alluded to it by discussing Burgenland. Are there other examples of being involved as a stakeholder?

Our mode of working is mostly with policy officers, academics of a certain field. Most of them are biologists. How we do it is by either carrying out projects we get, or working combined with environmental political lobbying. Our engagement in these planning processes, it is from the leader point of view, it's on a voluntary basis. The authorities are not obliged to involve us. We only have these legal rights if it comes to Environmental Impact Assessment procedures. Then, we have got legal standing, and we are also an acknowledged environmental organization by the Environmental Impact Assessment act. If the wind farm has an output not coming up to a certain threshold, then it's only carried out under the nature protection law of the certain state and not under the Environmental Impact Assessment act. Then, we are out and don't have legal standing. We have environmental attorneys of the Länder...In every state, we have an

ombudsman and he has to represent the public interest of a healthy environment in the procedures. It is like a substitute for other actors of civil society. Formally, in nature protection methods, you only had the operator and the authority and nobody else. It was just made out between the two of them. Then, they thought it could be too. 'We have to focus on transparency and public participation, so we are setting some ombudsman institutions.' All EU Member States are party to the Aarhus Convention, an environmental international treaty. This convention is also influencing us very much when it comes to public participation rights. It stipulates rights to environmental information, public participation, environmental procedures like under the Environmental Impact Assessment Directive, and access to justice. Now we are confronted in Austria with an infringement procedure by the European Commission because it says that we are not fulfilling our obligations by not giving legal standing to environmental organization citizen initiatives, in all environmental sectoral laws. We don't have it under the Water Act, we don't have it under the nature protection laws, the Waste Act, Mining Act, and so on. Only when it comes to Environmental Impact Assessment procedures. When it comes to wind farms, they only have to carry out an Environmental Impact Assessment when the nominal capacity comes up to at least 20 MW. If it is located in a special protected area, under the Birds and Habitat Directive the wind farms at least need to have a put out of 10 MW. If you don't fulfill these thresholds, it's only under the nature protection law of the states, and then the public is out. What we are pushing for is to get this strategic planning. We do it on a political basis and with media. One of our partners is to get out to the public by the media to address politicians and the authorities, to get us in on the process. Sometimes it works and sometimes it doesn't work and sometimes we are in and not taken into account what we are saying, so it is like a show, and sometimes it's taken honestly. If a zone is a 'go' area, you always have to get the permission. It doesn't substitute the permission. It only says this area in general is suitable for getting the wind farms built. It's the planning. If you say, "Okay, within this area I want to have it," you have to go through the authority and get your permission. They have to do that procedure. Like if you want build a house.

So, the EU directives of nature conservation plus the lack of coordination across Austria is supporting your push towards a more coordinated effort of a national planning framework for wind energy. Is that fair to say?

Yes. We are very much behind. When it comes to Nature 2000 areas, which we have to nominate to the Commission, we now also have an infringement procedure. We have many infringement procedures concerning environmental methods, so we have to re-nominate 220 Natura 2000 sites. That also comes into this discussion. There are some areas which were not nominated as a Natura 2000 site and this also has to be taken into account when it comes to this zoning of suitable areas for wind farms.

I imagine this slows down development quite a lot and also slows down your work. Has there been any coordination with wind farm developers in supporting new regulation? Because if there are clear laws or statutes...

We have laws which say how to invest in renewables and how much the percentage of renewables should be. We have the Green Electricity Act, that says plus 2000 MW [of wind] until 2020. We also have to fulfill the new now 2030 [EU] goals, like to reduce CO2 emissions

minus 40%, plus 27% renewables, and plus 27% in energy efficiency. These are our new goals. And we have this Green Electricity Act, which gives a certain amount of MW for each renewable energy, which we should reach by 2020. For wind, its plus 2000 MW. That is the goal. That is the framework for this. And where it has to be built...it should be in a more coordinate way where the area is suitable. And then the procedure with as much public participation of all stakeholders as possible. Not only when it comes to Environmental Impact Assessment procedure, if the wind farm is very big or over the thresholds. Also when it is a smaller wind farm, which has only to be accepted under the nature protection law of the certain state.

You answered my question on how your organization is involved in site selection or impact assessment. Is there anything else you wish to add?

In Austria, we have 45 acknowledged environmental organizations under the Environmental Impact Assessment Act. One of the requirements is that you have been working for three years, that you are a non-profit organization, that in your statues it is written that you do something to improve the environment, and that you may not be a company with profit like a limited liability company. You are a non-governmental organization. Then, you have address our environmental minister. He looks up whether you are fulfilling the prerequisites, and then you can get the permit. Then you can be engaged in environmental impact procedures but you always have to give your opinion. If they say, "We want to build that," and it is publicly announced, then you have to give your opinion why you are against or what are your concerns about the project. Only then do you have legal standing. If you do nothing and say nothing, you can't...fight the permission. You have to make a statement. You can only fight the permission with regards to the respects where you have made your statement. If you say, "Okay, with regards to this wind farm, I only have concerns about bats" and then you say, "Okay, there is also this migratory bird which could also be disrupted," and you haven't said something to this, you can't fight the permitting to this aspect. You lose your legal standing with regards to these other environmental aspects you haven't said nothing about. Our work is legally engaging the procedures, partly working with media, and lobby. We also are getting financed by projects. We are trying to get the right projects, and to push in this way our environmental positions.

Has your position evolved on wind farm development? Right now, you have this great list of recommendations but has it always been that way? Was there something that encouraged you to change the position on wind farms or develop it further?

It was quite a discussion with our member organizations. There are various branches of member organizations and it was very difficult to get this position coordinated with our member organizations. This paper is from February 2012, and it was not our main focus in the last year [2011]. We mainly focused on hydropower stations, and this was a rather new topic that popped up. We sat together, with BirdLife and Naturschutzbund and nature protection organizations, and we also have organizations focusing on the alpine regions. There are also many problems. It is not only that wind farms should be built in suitable areas like Burgenland. The pressure is increasing on the alpine region. Formally, it was only with hydropower stations and now it's also on the peaks of our alps. Big wind farms, and that is a problem. It was hard to coordinate the positions of our alpine nature protection organizations. I think it was quite a good

compromise. We are saying that we are not against because we have to have renewables. We can't say no, no, no. It's like a differentiated position. "Yes, but under this and that condition." I think it's quite okay to have this opinion. It's been accepted that we are not too much in one or the other direction. It's always a compromise for environmental matters.

This question is about recommendations on how to achieve that balance in sustainability, between social, environmental, and economic sustainability. Are there any recommendations that your organization puts out?

So how to combine it? When it comes to renewable infrastructure, we see there is a hard pressure to get away from the fossils to renewables. We have to find a mode on how to do it in a coordinated way. What we are saying is, first, there is to get a new way of thinking that there are limits to growth, like Dennis Meadows says for example. Firstly, invest in energy efficiency and to abandon waste of energy. That is the first thing. It is very hard for us because if you are used to a certain standard, you don't want to make any compromises. The second thing is if there are already [wind] installations in the countryside, it's better to renovate or [restore] this installation than building up a new one. Third step, if it is really, really, really mandatory to build a new one, then it should be in a coordinated way, and with a strategic planning in the background, and with involvement that is efficient and timely of the public stakeholders where their opinions are really taken into account and their opinions are getting heard. **What we are always having is, for example, amendment to environmental laws, and then they have to send it out to certain stakeholders. They have to do it because it is legally written down. You have maybe two weeks, sometimes six weeks, a short time to formulate your opinion and hand in your statement. Then, the law is decided upon like it was sent out. "Yes, we have made the public participation process. We have taken all the statements into account." If you are looking at the paper, it is the same text as before. They have done nothing and that is frustrating. It shouldn't be just to do it...Because economists are frightened by public participation. "It takes longer. It's more expensive. What about our project? If it's now blocked...It's all so so difficult with so many people saying their opinions. It's not so easy."** Of course it's not so easy, but in the end it's better accepted and you get input from other people. Maybe you can improve it. That also requires some change of mind. We are at the beginning. We see it is getting better. Most incentives are coming from the EU, with infringement procedures. In Austria, we have the situation with our infringement procedures. Most probably, it has done nothing. They are waiting for the infringement procedure, or for the Directive they have to transpose. Compared to other countries, we have very high environmental standards. If you are Africa, Asia, or the US, in Europe generally there are high environmental standards. What politicians are also finding is that big industries go to other countries to produce, because it's cheaper and you don't have these high environmental standards. In Austria, you have these discussions first in Upper Austria and Linz. Voestalpine AG is producing steel, one of our biggest companies here. They are saying if it is going on like this, we are going to the US and saying goodbye to Austria. With thousands and thousands of working places [jobs].

With hydropower, we have the situation that it doesn't pay anymore because the prices got so cheap that they say, "We won't invest this year or next year. We have the planning, the permits, but it doesn't pay." The pressure is now more going to wind, because in hydropower you can't

make money anymore. First they say, "Yes, we have to do it to fulfill our renewable energy targets." They say this in the procedure, and there is an overriding public interest to do so. If you have a protected area, you can build there if, for example, not a bird or a bat is disturbed. Then, you can build your project in a protected area. It always depends if it is disturbing this protected good, which was the reason for zoning. Then, if it would disturb a protected good, we often have exemption clause. The exemption clause is if there is an overriding public interest. They [wind developers] are making very very much use of this, and that is also our problem. The exemption clause is getting the ruling. Not always, but there is a trend. To sum it up, we have three steps: No waste of energy and energy efficiency; to renovate existing installations; and if there have to be new installations, then do it in a coordinate way with strategic planning carried out before. That is what we are proposing.

The same three points could be applied to any energy source. Have you thought about the transmission lines or the electrical grid?

Yes, the Projects of Common Interest (PCI) and the infrastructure to build up a common network. The EU is working on that. There are legal initiatives in that field to get a European, not only like Natura 2000 sites or a European ecological network, but also to get a European energy network. Some projects are concerned to be of PCI, and they are listed in EU law. These are presumed to be of overriding interest. We are building that up now.

I am curious if there is any overlap between what you are proposing, because that will cut through forests or wetlands.

We only have it on the European level, these initiatives to get these strategic plans all over Europe. And to get some dependency from Russia, with our gas pipelines. We have to get energy autonomy, or energy independency.

Appendix G

Interview with Karl Schellmann
Climate Change & Energy Speaker
WWF Austria

December 2, 2014

You were saying that 2% of all land in Austria is dedicated to wind.

In Lower Austria, it's less than 2%, like 1.8% or something. In these area's you can apply to build.

The suitable zones?

Yes, exactly. You still have to do your environmental impact assessment. There will still be a check on the local situation, because these general zoning things, they have some general criteria. They say, "Here is an important bird area." If there are really birds in that area, then you just have to check in the spot.

That's the thing with this article we wrote, "Woher nehmen wir die energie?" [Where do we get the energy?], and tried to get an overview of the renewables. Then, we always get a lot of calls and e-mails about these topics and so we tried to get out some difficult questions and answer it from the energy and nature conservation perspective. We tried to look at these things from both sides. For me, that is the interesting part about the WWF is that we have both sides within the organization. The main idea of WWF is that humans are living in harmony with nature. So we have to look at the needs of nature and the needs of the people, and how to get this, what we say in Austria, "under one hat."

This is a paper that may be helpful: 10 Punkte für eine sichere, umweltfreundliche und leistbare Energiezukunft in Österreich (10 points for a safe, environmentally friendly and affordable energy future in Austria). We had a discussion with some colleagues from other organizations together with Verbund, which is the big hydropower company in Austria. We had a discussion process with them before the last elections, two years ago. We wanted to see if there were positions between the NGOS and these companies pushed together towards the politics. It's a good paper with quite a few interesting points. In the end, we didn't really manage to come together for a common outreach. It was too hot politically.

I want to understand your role as a stakeholder from when wind was first taking off in Burgenland to where it is now. How have you been involved in development?

Burgenland development has been documented very well in our research. It started 10 – 15 years ago, and we were not so much involved at that time. We were one of the stakeholder

NGOs at that time. BirdLife was much more involved. For a long time they were working in the area. They have a lot of bird data. It started with the need for long-term development plans at the time where the EU accession process was. The politicians of Burgenland have been clever enough to use this necessary exercise for the EU funds and made a quite useful program for the whole development. They used a lot of the EU money for the development of the zoning process, infrastructure, and also started two technical schools in this field. They really did quite a lot around the whole topic of renewable energy. That's why it was developing so well there. They also included NGOs and the public from the beginning so they have very little conflict in Burgenland, even when they have as many wind turbines as in Lower Austria. In Lower Austria, the politicians were a bit cowardly, they didn't want to take up this topic and they just left it to the municipalities to decide whatever they want. "We are not getting into it." For more than ten years, the government of Lower Austria really kept out of this topic. There was a lot of uncoordinated development and the people were very scared because they didn't know what was coming up. There was no clear plan. There was no clear communication. And now in Lower Austria, you have initiatives against many wind parks, which is almost not happening in Burgenland. That's why thought it was a very good example. Also, these two places which are very close and have very similar wind conditions but different political approach shows how it should be or how it should not be done. That's why we thought it's helpful to have a closer look into it. We developed some recommendations out of it.

In the Burgenland development from the beginning, my colleagues were a little bit involved aside from Birdlife but only when it came to specific questions about projects. BirdLife was much more important to the zoning process, as the birds were the main criteria for the zoning which was done there. This was the beginning of the development. Two years ago [2012], we heard from contacts in Burgenland that they are now thinking to change these zoning areas. There were demands from some municipalities to get some more space for wind turbines because they have good wind conditions and it is quite a good income for municipalities also. They all need the money, so they wanted to increase the wind areas. Which is not in general a problem but has to be done according to clear criteria, if it should be done. That is where we got a bit more involved in the discussion. We used the contacts we have in Burgenland to tell our opinion, and there was a consultation process where we have been involved. In the end, also when we did a presentation of our program, the head of the Burgenland government Mr. [Hans] Niessl was there and did a press conference together with us. He said, "The big development of wind power is done." He is not willing to design much more space for windmills that they have already. So he was really very much sticking to the plans, what we have until now. That was one of our goals, to get him really standing behind the plans which we have. Especially in the north of Burgenland where we have the best wind conditions, it is already a lot. More would probably really damage the environment.

When did Governor Niessl come out and say that they were done building in the north?

I can send you the press release.

The area of north Burgenland is saturated. It's full or at capacity more or less.

There are still some areas within the existing zones which can be built, but there will not be new

zones designated for wind development.

And that is in contrast to Lower Austria, where there is a freeze on development.

There has been a freeze because the conflicts got too heavy. The politicians said, "Okay, then let's stop everything and make zoning." At this point, we were involved and had discussions with at administrative level and at with the Umweltanwaltschaft (Environmental Advocacy Agency). He said, "Okay." The politicians said, "Let's stop it and make a zoning within one year." We said we would give our information, experience, and materials that we prepared so far. Then they called and said that it had to be finished within three months because they want to make a quick decision. We provided our materials. Then the whole process of detailed zoning was done between the administration of Lower Austria and BirdLife mainly. They had their first draft and we did a quite intensive input to it, together with my colleagues who are more the conservationists. We checked the details, we had a look at certain areas, and suggested some changes, which were partly taken, but I think not more than half of it. Also BirdLife had a lot of changes they still wanted to do but again they make a decision that there was also a lot of feedback from municipalities. Some are interested in getting more [turbines] and some who are interested and not close. So it was a very quick process. Much too quick for a real thorough discussion. That's why it didn't change so much. There are still a lot of protests. There is still a lot of opposition. But, it's good that at the moment we have a map of where we are I think 85% okay with it.

There are some areas…North of Burgenland, just across the Danube. The corner between Vienna, the Danube and the national park along the Danube, and the border of Slovakia. This is a very good wind area but it is also a very important bird area. We actually would like to have this whole part free of wind turbines, but there are already a lot of them existing…We say that we would like a 5 km buffer zone along national parks. You have a lot of eagles and other big birds that are moving far into the country. The national parks are very small as the country is small. The national park in the north, Thayatal, is a conflict area. Here in this forest, it belongs to the state forest company. They are planning a wind park there. It is also in the 5 km buffer,w what we say is necessary around the national park. I am not sure if they are still trying to develop the area. They are also under pressure from the local people which want to keep the national park. Most of the zoning exercise was done quite well, mostly because they had the information from BirdLife, other organizations, ourselves.

In Burgenland, was the national parks 5 km buffer implemented?

No. When Burgenlad [zoning] was done, we didn't yet have this position. We developed our position towards wind energy in the last three years. We said there are also areas like Natura 2000 sites and other protected areas where we say 1 km is enough. But the national parks and the big unfragmented landscapes. There are still some areas of Austria where you have bigger landscapes without roads or without bigger infrastructure in between. For the long-term, we also would like to have these landscapes under some kind of protection. Some are already national parks or similar things, but they are still very unprotected and that's why we would like to have them out of any sort of infrastructure development. Around this, we also apply, from our point of view, a 5km buffer zone. This was one of the points that was not going into the legislation. In

the unfragmented infrastructure, there are no cities, streets, infrastructure, and so on. The 5 km buffer zone is on our wish list. If somebody asks us to a certain wind project, we look to such things. There are also areas where we say okay. It is possible to build it. Of course, you still have to look at the situation on the site. If that is okay, then let's do it. We need it in the end. We need a change of the energy system. We need to produce all the possible renewables that are still inline with our nature protection criteria.

In thinking about development of renewables and their environmental impacts, what considerations are for the electrical grid or transmission lines that might cut through protected areas?

There are two sides. One is where you directly have the wind park. There you need a grid connection. One criteria is for the siting of the wind park. If you have nearby the electric grid where you can insert it [the generated power], then you have to go underground to the grid. They are not really destroying much through the grid connection. The second point is that renewables, because of their unsteady production, they need connection. If you have less wind in one part of the country, you have more in the other. There must be a balancing process. For this, the grid connection is important and for the long-term the problems that we have from climate change and from reusing the fossil fuels are much more than the few electricity lines we have to build. In Austria, it is a bit easier than Germany. Maybe because the country is so small, we have a better interconnection. Germany has big problems between the north and the south. They also have much higher volumes of electricity through these big off-shore wind farms and so on, what they have to move and transport. In Austria, we have 2 – 3 smaller areas where connection with bigger grids is needed. There, we have ongoing discussions. Like in Salzburg. It is a very tricky discussion because you have the interests of the whole energy system, and that is different than the interests of the people living there. For us, we see both sides. Both sides are right in their way. There is not really a perfect solution. In the end, for the energy transition, we need a better grid connection. Balancing is more needed for renewables. With fluctuating production, you need a better balancing system than for the bigger fossil fuel plants. What we also still need is to look at storing technologies. The more local you can do it, the less grid you need. What we also learned about the grid system, is that the people who are running the grid don't know enough about their own grid. In the past, it was just built for the few big power plants. They were build in such a dimension that they [grid] never had any problems with it. Now, we find out that we have to efficiently use it. You need a lot more information about how much capacity you can get through it, what temperature the grid has (depending on how the electricity goes through it). We had discussions with the technical university and they said they have projects in some areas where they could get 50% more electricity through the grid than anyone though before. Just because nobody knew really what was going on in the wires. There were no measurements. There was nothing installed. It was never needed. Now it is. So you have these intelligent grids where you get information about the capacities, temperatures, and all things that are necessary. That is a very important topic. To first use the existing grid well and then we can think about new grids. There still has to be a lot done before we are agreeing to build new things.

To review, the grid connection from the wind farm to the substation, the impact is minimal because the cables are underground. The grid is well developed in Austria already. It just

needs to be more efficiently balanced through smarter design in order to better integrate the renewables.

The better the electricity storage technology, the better we can use the existing structures and don't need to build new ones. What is a big future topic, from my point of view, is the power to gas discussion. To produce gas out of electricity. We have a very good gas network. We have good storage. It is all there. We just use it and store a lot of energy there. With the gas power plants, you make it into electricity if you need it. It still has to be developed. The efficiency is not very good until now, but this is from my point of view one of the big topics regarding electricity storage in the future. They also discuss thermal storage. Big water tanks with thousands of cubic meters underground, where you can store a lot of energy. This is also a topic with very well known technology, which could be quickly installed and not too expensive.

So there is no real issue of any transmission line extension into areas where there are a high amount of wind farms, as long as the substation is there and developed.

For wind development, there is no big need for the bigger grids. From the overall situation, you also need international exchange because we are in one electricity system with Germany. It makes sense to have these connections well-developed. For the whole energy transition, I think we need more grids. But first we have to use what we have properly. Then, we have to do good planning and see if it is in some areas feasible or to go underground. This would cost a bit more but we get a good overall situation.

Going underground would be better and have less of an impact on the environment.

In many cases, yes. You dig it in once and basically it is set. You don't have birds flying into it. You don't see it. For many people, the visible disturbance is the problem. Of course, there are landscapes which would be much nicer if you don't have these grids. It is still much more expensive. The more you do it, the cheaper it gets. I think it is necessary.

Have you been involved in impact assessment at the beginning stages of wind development?

We have been very much involved in the zoning process at a strategic level, but not so much in particular on the impact assessment of a certain wind park. This is a very technical process where the wind developers have to get their studies done and they need some technical assistance. This is not our role.

We have discussed it a bit - the extent of communication and participation of WWF. Is that ongoing, compared to where it was before?

We had quite a peak around the zoning process in Lower Austria. We were very much involved. At the moment, it is not so much a topic. It sometimes is popping up when they plan another wind park. Then, usually the municipality is organizing information, campaigns for their people, also sometimes doing questionnaires. And then people contact us. "What do you think about this wind park? Isn't it destroying our area?" Then, we have a look at our exclusion zones and what do we think about it. With more clear positions, what we have now is easier to say if this is a

good or less good project. That's why we were involving ourselves much more in the zoning process, because then you have with one process where you have quite a good picture over the whole area. What is also interesting is we have here in house [WWF Austria], the head of the Danube Carpathian Program of WWF. This is a program which is starting from Hungary and to goes to Ukraine, all along the Danube and the Carpathian Moutains. At the moment, I am in contact with colleagues from Romania because they are participating in zoning process, which the European Bank for Reconstruction and Development (EBRD) is conducting in Romania. They want to know, according to the environmental and social criteria, where we can still invest in wind farms and where we should not. They also use our experience in Austria to discuss the wind power development there. It is very useful, even when in Austria most of the interesting areas have zoning. It is useful in other countries.

I am curious about the tendency to reuse the wind power sites. The wind turbines can be good for up to 20 years and the leases are around 20 years. Has there been any thought given to repowering wind farms for higher capacities, so that less space is needed and the environmental impact is less? Any push to encourage this modernization?

This has started happening. It usually doesn't increase the area they use but it increases the electricity output. They use the same places with higher and bigger turbines. This makes sense. If you have an impact, use it as best as possible. As far as I know, but IG Windkraft will tell you more, the wind developers have to put money aside for reassembling the turbine after their lifespan…At the moment, we have a problem that the whole electricity market is in change. The electricity prices have gone down so much as well as the price that you get for the electricity. At the moment, it's hard to run any power station without subsidies. What you get for the electricity is less than what the wind companies need just to run their existing wind turbines. Now, they have already discussed about closing or removing wind turbines, which could still work, but they are at the end of the state subsidy time. What they earn from the electricity is not enough to run it. We have the same problem with all of the other electricity plants. They are now stopping the gas plants in Austria because the gas is too expensive. They cannot run it. The only things that are still running well is the coal because it is so cheap. Part of the cheap coal price is because of the US exports, which are rising because of the change to shale gas. Now they send all the coal very cheap abroad. For the climate, there is no change because it still burns but just somewhere else. If we really want to limit climate change to under 2 degrees, we have to leave 75% of all the known fossil fuel reserves in the ground. So actually we should stop completely getting all the oil, coal, and gas from out of the ground. At least, we should stop starting new fields. That's the big problem.

Any last thoughts on what you would want wind developers to do to promote environmental, social, or economic sustainability? Any changes or best practices you would like to see?

On one hand, it is very clear that we need an energy transition. We need to get rid of the fossil fuels completely within the next three or four decades. According to the IPCC report, we have to be worldwide at zero emissions in 2070 and then get into minus. There is an urgent need. On the other hand, we need to achieve energy provision for all people on this planet. What we have at the moment is a very unfair situation. Lots of people still don't have access to any energy. If

we make something new, we have to make it in a sustainable way – 100% renewable. Therefore, we need, on one hand, very clear targets from the political side, which is especially in Austria very difficult. We have a discussion about targets for 2030 here in Austria, and especially the Federal *Ministry* of Science, Research and *Economics* don't want to discuss targets at all. We need to stop the fossil and nuclear subsides. More than two-thirds of all the subsidies in the EU go to fossil fuels and nuclear. It is almost 80%. What we also need to do is internalize the costs, which are now paid by the public. All the health costs because of the coal emissions. Such things need to be in the energy price. At the moment, it is all paid by society as a whole. We need a fair CO2 price, which the existing emission trading system is technically working but practically not achieving any results. A ton of CO2 costs €4 – 6, and in the beginning when it was designed it was calculated for €30 – 50. To really have an effect, it needs to be €50 – 100 per ton. At least ten times more than it is now.

What is also a very big and important area, which is often not seen, is the whole finance system because there is no big power plant built without any international credit involved. The criteria that these international financing agencies are applying to there loans are very important. We did a lot of work on the European level with the European Investment Bank (EIB), the biggest bank in the world. It has more money than the World Bank and the EBRD. We tried to convince them to have more strict criteria for their energy projects, which was partly successful. The EIB now has a carbon intensity limit. They will not fund projects that have more than 500 g of CO2/kWh. So you cannot build a simple coal power plant, because they have more than 1000 g. We still would like to have it lower. We think something like 300 – 350 g of CO2/kWh would be a really good level to push for the best available technologies.

And we need more investments in research development and implementation of the latest technologies. A lot of things are already possible, already available, but they are not really used properly. This is a big topic where the state system has to play a big role. The whole tax system in Austria is called steuer, which also means 'steering.' Taxes are really steering the development a lot, and it always depends on how they are designed, if they support the right things or not. At the moment, we have a coal tax but all the coal power plants have exceptions so they don't have to pay it. It's on one hand that you have a good legal situation. On the other hand, you really have to implement it in the right way. I think these are the big topics that we have around the energy transition.

There are some things that we still missed in the development in Burgenland. It's very good compared to other areas, but there are still some things missing which they could have done a bit better. We discussed with the politicians and administration in Burgenland. It is included in the English version I sent you. For example, when you build a wind park in one municipality, they get quite a lot of money but the neighboring ones are not getting anything. If you have more local planning where you can share the income for the municipalities on a bit wider area, then it is easier for the others [municipalities without a wind farm] to accept that it is there and not here. It's done in Austria a lot with spatial planning for the planning of industrial areas, where it doesn't make sense to try to get industry in each single municipality because they have different conditions. So, they do a planning process over a bigger area and then they share the revenues. That's quite a clever system and that is also something we should be doing with the energy planning and projects.

Appendix H

Criteria in Burgenland's Environmental Impact Assessment

1. Engineering
2. Electrical
3. Shadow Impacts
4. Landscape protection
5. Material assets and cultural heritage
6. Waterways
7. Traffic engineering
8. Fire protection and building construction
9. Aviation
10. Sound/Acoustic noise and medicine
11. Forestry and hunting
12. Geology
13. Tourism
14. Nature Conservancy
15. Agriculture

Appendix I

TransWind Research Project in the Institute of Forest, Environmental, and Natural Resource Policy at the University of Natural Resources and Life Sciences Vienna (BOKU)